

FR-Family

Frequency Inverters

Intelligent Drive Technology Top of Every Class



Cost-Effective /// Reliable /// Safe ///
User-Friendly /// Network-Capable /// Flexible ///

Universally accepted



Installed over 11 million times

Drives for all conceivable applications: there's something for everyone at Mitsubishi Electric! With more than 11 million of our frequency inverters installed we are one of the largest manufacturers in the world. Day after day, in heavy-duty industrial use, our frequency inverters prove their high levels of cost-effectiveness, reliability, functionality and flexibility.

Frequency inverters developed by Mitsubishi Electric are used routinely in many sectors and systems – and that's not all. Mitsubishi Electric know-how also features in many frequency inverters made by other manufacturers who are utterly convinced by its technical edge and economic benefit.

Always one step ahead of technology

The new technologies applied by Mitsubishi Electric in developing their frequency inverters result in highly dynamic drive systems and genuine power misers. Two new functions indicative of this innovative strength are RSV Control (Real Sensorless Vector Control) and OEC Control (Optimum Excitation Control).

Meeting global norms and standards

Mitsubishi Electric's frequency inverters meet all the standards and specifications laid down in the EU Low Voltage Directive 73/23/EEC and the Machinery Directive 98/37/EC. Needless to say, all the units carry the CE mark and are certified as conforming to UL, cUL and GOST.



Frequency inverters made by Mitsubishi Electric carry all the major national and international marks of conformity.

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The six ingredients for success



Cost effectiveness

Energy savings of up to 60% can be made by using Mitsubishi frequency inverters, thereby also reducing CO₂ emissions and protecting the environment.



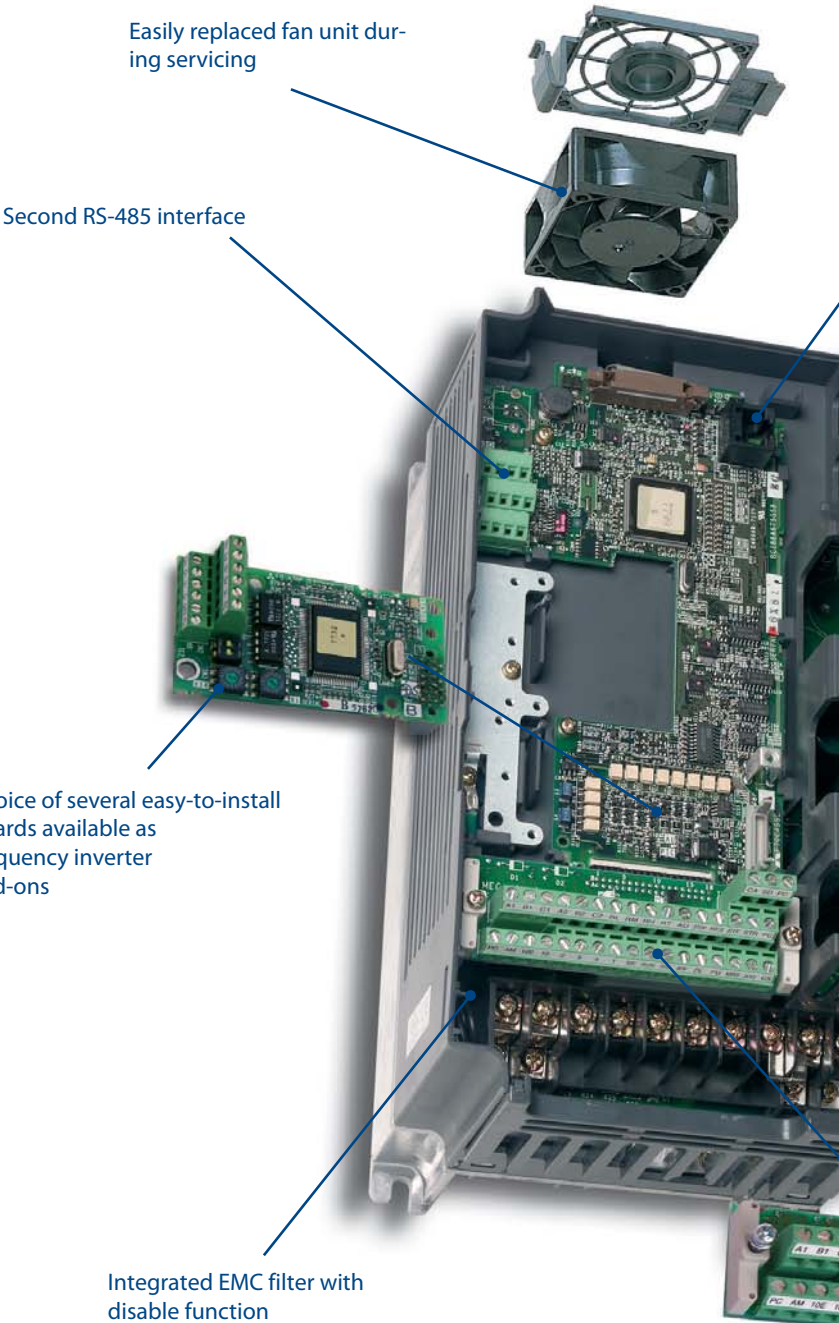
Reliability

Safe and fault-free operation is guaranteed by various protective mechanisms and overload functions, top-quality temperature-resistant capacitors, permanently lubricated fans and dual-coated power and control PCBs.



Standards

In addition to complying with well-known international norms and standards, the frequency inverters are also certified by the Det Norske Veritas foundation (DNV).



RJ-45 port for programming unit and RS-485 communication interface

Removable parameter unit with digital dial operation



Removable terminal block



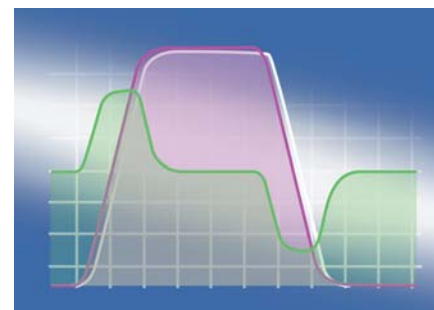
Convenience

The integral multifunction user panel, complete with digital dial, facilitates rapid and efficient input of all necessary drive parameters. It can also provide display of various performance data and error messages.



Flexibility

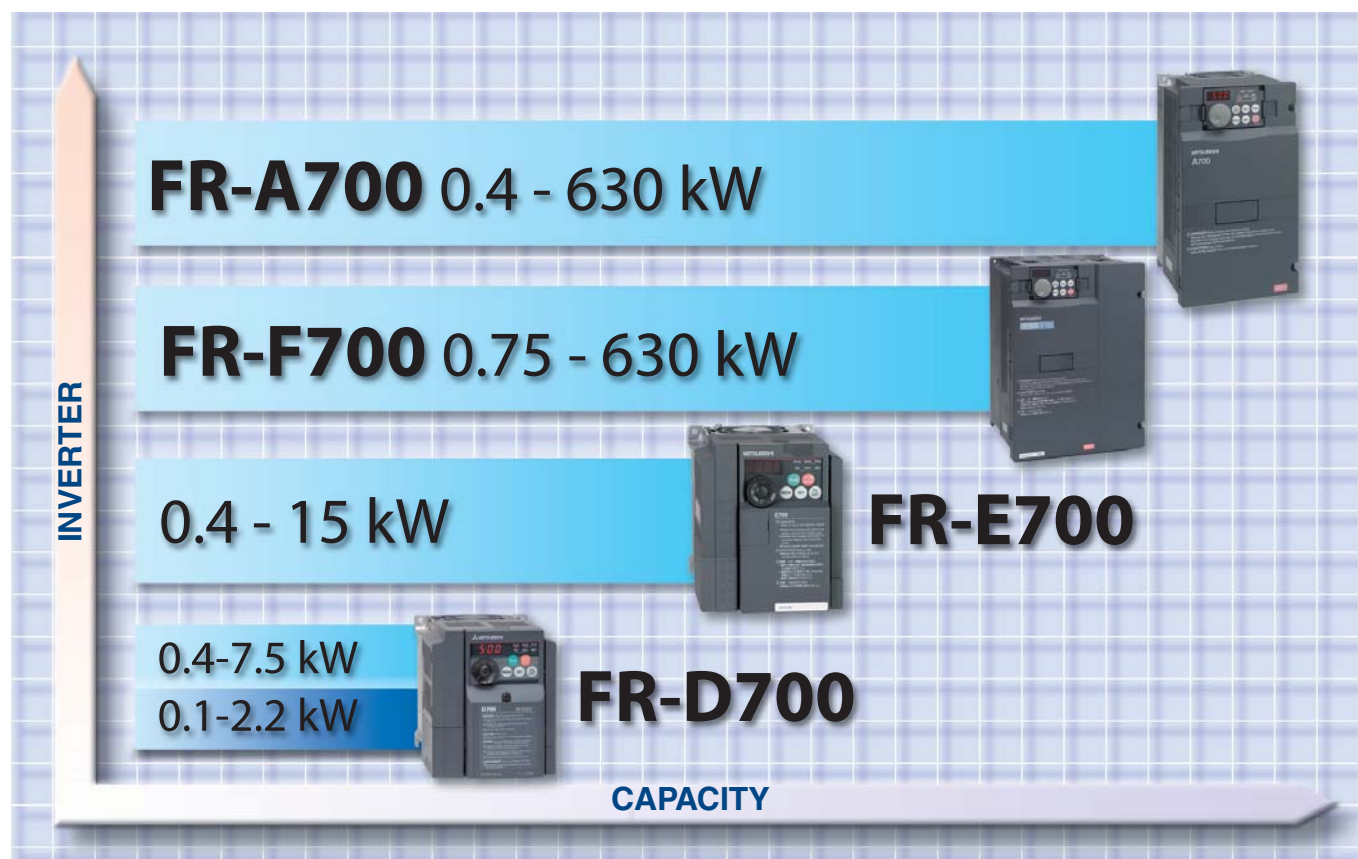
Compatible with all major field bus systems such as Profibus/DP, DeviceNet, CC-Link, CANopen, Modbus and LonWorks (the international communication standard in building services automation).



Functionality

Functionality, compatibility and perfect mechanical design are the main features of the frequency inverters supplied by Mitsubishi Electric.

The right solution every time



A diverse product range helps you make the right product choice.

Well set

Mitsubishi Electric always has the right drive system for straightforward and complex applications alike. With so many sizes, outputs and features, the right frequency inverter solution is available for every conceivable drive requirement.

Indeed, in applications where space is at a premium, it can pay to know that Mitsubishi Electric frequency inverters have numerous overload versions.

In many cases a smaller frequency inverter can be used - logically resulting in reduced purchase costs, lower running costs and a smaller footprint.

The majority of frequency inverters supplied by Mitsubishi Electric come as standard with 200% overload capacity. The benefit for the user is that our frequency inverters offer double the output of comparable types made by our competitors.

FR-A700 – High-end inverter

These new frequency inverters, developed by Mitsubishi Electric, boast cutting-edge technologies for optimum motor torque and speed control.

Up for new challenges

The FR-A700 series offers high-tech drive engineering at its best. The key features required in a modern day, high-end, frequency inverter include; drive performance, the range of drive functions and technology as well as control functions, compatibility and overall mechanical design. The new line of FR-A700 frequency inverters combines all these features to maximum effect in terms of performance, cost-effectiveness and flexibility for mechanical engineering and process plant engineering applications.

Technology functions, such as “Real Sensorless Vector Control” and “Online Autotuning”, provide excellent speed stability and smooth motor-shaft rotation. Other functions include controlled power reduction after emergency shutdown, numerous digital inputs and outputs, integrated PLC functions, and many other new features which characterise the latest generation of high-end inverters to be engineered by Mitsubishi Electric.



Intelligent solutions for every requirement



The FR-A700 is suitable for use in a broad range of applications e.g. conveying and handling systems



Dynamics and precision: FR-A700

FR-A700 at a glance

Power range

FR-A740: 0.4 – 630 kW

Input

380 – 480/500* V AC 3ph (50/60 Hz)

Output frequency

0 – 400 Hz

Protection

up to 22 kW IP20, from 30 kW IP00

Control

V/f, OEC, RSV, CLV

Integrated interfaces

Modbus RTU, RS485, USB

Optional extras

Analogue + digital I/Os,
encoder feedback, master-slave

Network links

CC-Link, Profibus/DP, Ethernet, SSCNET,
CANopen, DeviceNet, LonWorks

EMC protection

Integrated

*Depends on performance class

The new drive behind your success



FR-A700: The wide power zone, of 0.4 to 630 kW's, is covered by range of conveniently sized units.

Intelligent functions for any application

■ Sensorless vector control (RSV)

Equipped with their new RSV function (Real Sensorless Vector Control), Mitsubishi Electric frequency inverters have the ability to control the speed and torque of a single-phase a.c. motor without an encoder. The result is maximum performance across the full speed range in terms of dynamic response, precision and control. The motor thus sustains optimum dynamic speed characteristics, smooth rotation and



Suspended loads can be positioned accurately thanks to motor and encoder feedback.

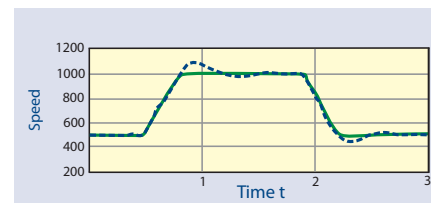
high starting torque. As such, the FR-A700 is capable of achievements which used to be the reserve of high-end d.c. or servo systems.

■ Autotuning

Precise motor data forms the basis for optimum control of the vector drive without an encoder. The new generation of inverters comes with an autotuning function which identifies all the parameters required for the motor model in less than one minute, even if the motor is not running.

Sufficient memory is available to store data records for up to two motors. Online autotuning offers the facility to automatically record and offset changes to the data in operation, e.g. caused by changes in temperature.

Another tuning process (easy gain tuning) simplifies optimisation of the speed regula-



Without tuning (blue line) there are significant variations in the setpoint speed, whereas there is a great reduction in overshoot with tuning (green line).

tor. The sequential response of the motor is automatically detected and the control parameters adjusted for optimum performance. Labour-intensive manual tuning of the control parameters is a thing of the past.

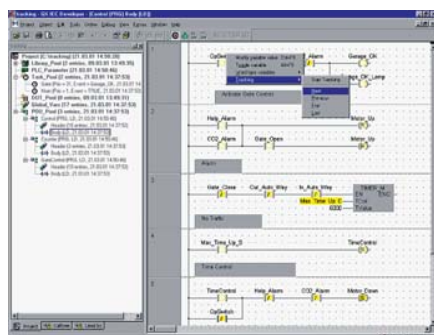
■ Economy-rate positioning

The FR-A700 can also be used for positioning in conjunction with the "Closed Loop Vector Control". The control in this case is taken care of by a sequencer, digital inputs or a network.

PLC functions

The PLC functions integrated in the FR-A700 mean optimum tailoring to the requirements of the user. The PLC offers direct access to all the drive parameters and will, on request, undertake plant management as a stand-alone control and monitoring unit.

Mitsubishi Electric's programming software GX Developer is a straightforward tool for programming the PLC functions.



Clear user interface layout with project navigator for rapid programming

Network-capable

The FR-A700 is highly versatile in terms of communication options. It is supplied as standard with an integrated USB port and a link to Modbus RTU. Other optional network connections include Profibus/DP, CC-Link, Ethernet and CANopen right through to the motion control network SSCNET III.

Integration in positioning systems

All the frequency inverters in the FR-A700 series can be used with servo drives within a motion system. Connection is simple using Plug and Play via SSCNET III. The FR-A700 can even work as a leading axis drive. As such, there is no reason why the drives cannot be integrated further in existing control concepts.

Self-diagnosis for easy maintenance

Frequency inverters in the FR-A700 range monitor their own operational reliability. The innovative diagnosis and maintenance functions monitor all the components which are subject to wear and issue prior warning when due. Precautions are therefore in place to prevent failure and long downtimes.

Many protective mechanisms and overload functions guarantee fault-free operation and therefore supreme availability and operational reliability.

Extended service life

Mitsubishi Electric frequency inverters are noted for their durability. The FR-A700 also sets the benchmark in terms of product life. It is designed to last for over 10 years giving an investment which pays time after time.

Fourfold overload capacity

Many manufacturers of frequency inverters have specified various overload rating classes for their products - but rarely more than two. The FR-A700 is designed for no less than four overload ranges! This makes it easier to select the best frequency inverter for any application.



Tuning made simple

Convenient operation

The FR-DU07 parameterising unit, complete with digital dial and 7-segment LED display, is supplied with the product for manual access to all parameters and operating modes. Other parameter units can be supplied on request.

The FR Configurator parameter setting software provides a number of handy functions. These include a graphical machine analysis tool for optimising the drive system or an automatic conversion tool for a smooth changeover from a previous model to the latest generation of machines.

The FR-A700 has an integrated USB interface for connecting a PC or notebook.

FR-F700 – The power saving inverter



Pump systems in industry - one domain of the FR-F700 frequency inverters

User-friendly operation

The built-in “digital dial” permits the efficient input of all the necessary drive parameters, cutting down on both programming and start-up time.

Long service life

The FR-F700 can lay claim to a 10-year service life thanks to advanced capacitors and ventilators. These features, along with its simple maintenance and automatic warning signals, make the FR-F700 one of the most reliable inverters on the market.



Economic powerhouse: the FR-F700

The frequency inverters in the FR-F700 range have been specially designed for pump and fan applications including heating, ventilation and air-conditioning installations. Besides their protection ratings IP00/IP20 (FR-F740) and IP54 (FR-F746), the outstanding features of these power-saving frequency inverters include their simple but safe operation and start-up, perfect control management and optional network-capability.

Effective energy savings

Pumps and fans are particularly good targets for great reductions in energy consumption. Energy costs can be slashed by up to 60%, notably in the lower speed or light load range of such applications.

Additional energy savings are effected by the cutting-edge “OEC technology” developed by Mitsubishi Electric. It supplies the motor with the optimum magnetic flux at any given time, thereby reducing losses. The result is maximum motor performance teamed with supreme efficiency.

FR-F740/746 at a glance

Power range

FR-F740: 0.75 – 630 kW

FR-F746: 0.75 – 55 kW

Input

380 – 480/500* V AC 3ph (50/60 Hz)

Output frequency

0 – 400 Hz

Protection

FR-F740: up to 30 kW IP20,
from 37 kW IP00

FR-F746: IP54

Control

V/f, OEC, SMFV

Integrated interfaces

Modbus RTU, RS485

Optional extras

Analogue + digital I/Os

Network links

CC-Link, Ethernet, Profibus/DP, LonWorks, DeviceNet, Siemens FLN, Metasys N2

EMC protection

Integrated

*Depends on performance class

FR-E700 – The compact inverter

Improved functions like an integrated USB port, an integrated one-touch Digital Dial control with a display as well as improved power usage at low speeds make the FR-E700 an economical and highly-versatile solution for a wide range of applications.

Small and powerful

These inverters are a popular choice in a wide diversity of applications, from textiles machines to conveyer systems, from door and gate drives to fans and pumps. Featuring Mitsubishi Electric's extended vector control system they are able to achieve torques of 150 % from a frequency of just one Hertz. The autotuning function makes this mode possible even with high fluctuations in motor characteristics. For the user this means ample power under all circumstances, even at very low speeds.



Material transport systems like this example in a printing works are just one of the many applications for the new FR-E700 series.



All FR-E700 units up to 7.5 kW are less than 150 mm high

Intelligent control

Thanks to the integrated PID control these inverters can be used, for example, to control pump flow or for temperature control without any additional expense.

Improved machine protection

Improved torque/current limiting during startup and deceleration ensures better protection for the machine, reliably preventing machine damage.

Network support

A selection of plug-in option cards are available for the FR-E700 that enable it to connect to open fieldbus systems like Profibus/DP, DeviceNet and even CC-Link.

The FR-E700 can be connected to open field bus systems like Profibus/DP, DeviceNet and CC-Link.

FR-E700 at a glance

Power range

0.4 – 15 kW

Input

380–480 V AC 3ph (50/60 Hz)

Output frequency

0.2 – 400 Hz

Protection

IP 20

Control

V/f, optimum excitation control, vector, advanced magnetic flux vector control

Integrated interfaces

RS 485, USB

Optional extras

CC-Link, Ethernet, Profibus/DP, DeviceNet, CANopen, LonWorks

FR-D700 – The standard inverter



Door and gate drives are only some of the multiple applications of the new FR-D700 series



Conveyor belts and chain conveyors are an ideal application for the FR-D700

Enter the new drive universe

The inverters of the FR-D700 series set standards for small-format drives and provide an easy entry to the world of modern variable-speed drive technology. Despite their ultra-compact dimensions they feature a wealth of advanced functions. The FR-D700 series is ideal for simple drive applications in environments where space is limited.

Improved functions and device properties such as simplified cabling thanks to spring clamps, the integrated Digital Dial with LED display, improved performance yield in the low-speed range as well as the integrated emergency stop function make the FR-D700 the new standard in the ultra compact class.

Simple operation

The user-friendliness of the FR-D700 series makes these units a particularly good choice for standard applications. Entering drive parameters and settings is quick and easy with the one-touch Digital Dial on the integrated control panel, saving time and cutting costs.

These features make the FR-D700 an excellent performer for both simple and more demanding tasks. Typical applications include feed and conveyor drives, machine tools and door and gate drives.

Space-saving installation

In addition to being extremely compact, FR-D700 units can also be installed directly next to one another. A version of the FR-D700 is also available with a special 1 cm thick heat sink ("Flatplate", up to 3.7 kW) for efficient and compact heat dissipation.

FR-D700 at a glance

Power range

FR-D720: 0.1 – 2.2 kW

FR-D740: 0.4 – 7.5 kW

Input

FR-D720: 200–240 V AC 1ph (50/60 Hz)

FR-D740: 380–480 V AC 3ph (50/60 Hz)

Output frequency

0.2 – 400 Hz

Protection

IP 20

Control

V/f, optimum excitation control, vector

Integrated interfaces

RS485, **USB**

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Pay attention that USB port is NOT AVAILABLE on the FR-D units, only on FR-A and FR-E.

Peripherals and software



Configuring the drive via a Windows laptop

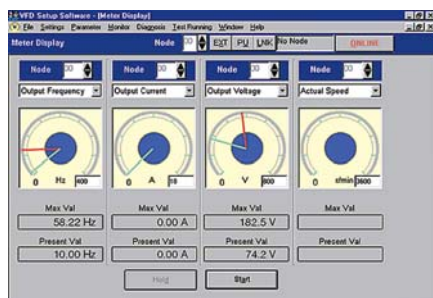
Handy parameter units

For added ease and convenience users may opt for integrated parameter units (FR-E/FR-D700 only) or clip-on parameter units (for all other inverters). A numeric keypad is available for direct input of numerical values. A four-line LCD display provides plain text information about performance data, parameter names, status signals and error messages – in eight languages.



Parameter units FR-PU07 and FR-DU07

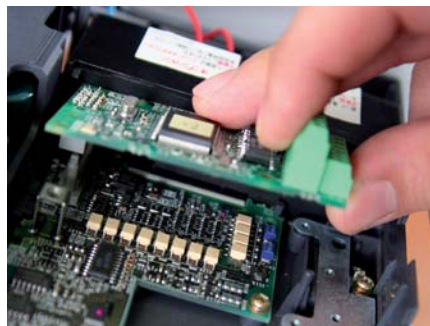
The user-friendly set-up software runs on Windows, i.e. the inverters can be configured using standard PCs. Several inverters can be set up, operated and monitored in parallel in one network. Connection is possible either via an RS458 interface or the optional SC-FR PC adapter cable. With FR-A700 and FR-E700 also an USB port can be used.



Quick and easy setting of the inverter

Wide range of expansion options

Optional extras are available to optimise and expand system capability. Additional brake components, reactors and filters guarantee operation even in difficult conditions.



Connector system for time-saving installation

The range of functions can be expanded by optional boards, such as additional analogue/digital inputs/outputs.

Strong and smart

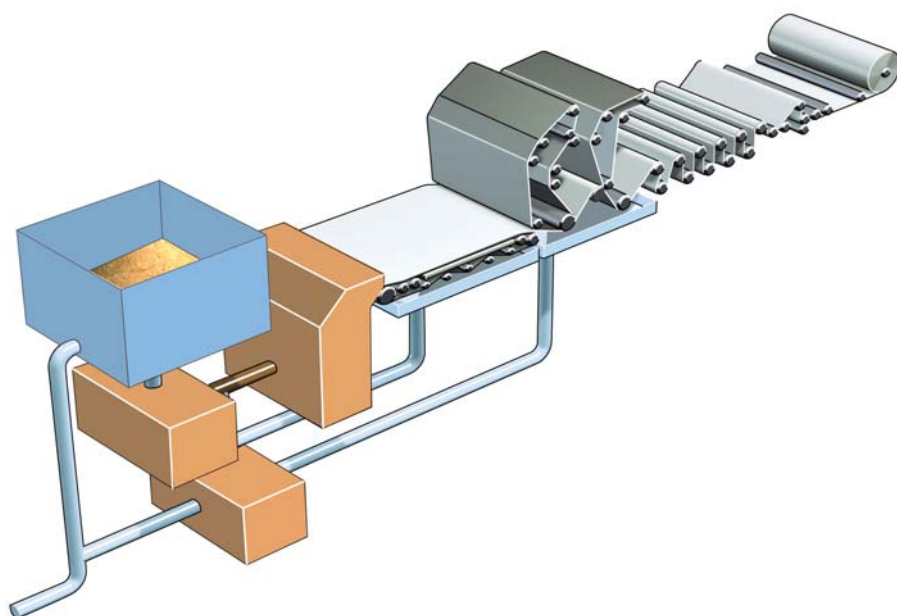
The separate Floor Standing Unit (FSU) for FR-F740 Inverters is a simple way of accommodating a free-standing frequency inverter system complying with protection class IP20 for installation in an electrical operating area.

The robust base units come pre-assembled and permit optional integration of a link reactor, a circuit breaker or – if required – an additional EMC filter.



FR-A 740 on IP-20 protection class base unit

Increased productivity



Simplified schematic of paper production

Precise synchronism of the drives is synonymous with maximum productivity and top quality in the printing and paper production industry. The drives need to retain control of the sheets throughout the entire printing and production process. The intelligent motor control function in Mitsubishi frequency inverters processes the actual values in next to no time and matches the speed and torque to the specified setpoint. This prevents the sheets from tearing or bunching.

Another feature which helps in this regard is the power-down braking function which controls the deceleration of all the drives after a power failure or an emergency machine shutdown. All this translates into maximum productivity and quality.

An advanced version of this control has the ability to operate up to four motors consecutively in alternate and/or changeover mode via one single frequency inverter.

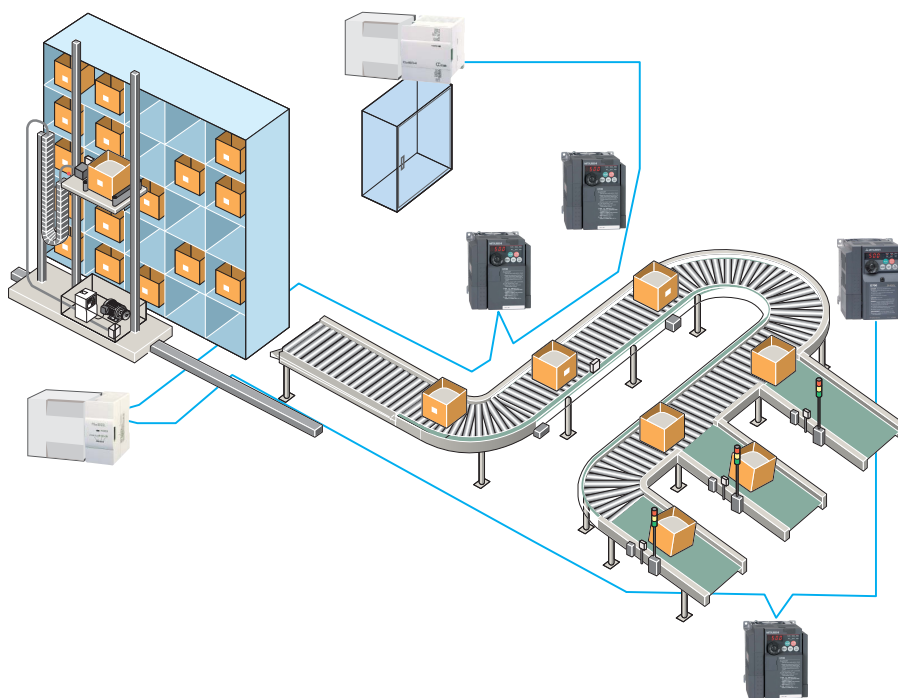
Prepared for the toughest assignments

High temperatures and high air humidity are routine conditions in the printing and paper industry. The capacitors in the top-of-the-range models, the FR-F700 and FR-A700, are therefore designed to withstand internal temperatures of 105°C. The power and control PCBs have two coatings and the cooling fans are housed in sealed, specially lubricated industrial bearings. There is no better way to prepare frequency inverters to meet human and mechanical requirements.



Productivity in paper production has one size parameter: tonnes per hour

Optimum speed



Palletising and warehousing in a high rack stacking system

This is precisely where top speed and torque response times are required for efficient compensation for sudden changes in load. Response times of no more than 5 ms are guaranteed to prevent product congestion and avert any risk to the follow-up process.

Rapid installation and start-up

Customers in the haulage and logistics sector want Plug and Play in order to cut installation and start-up times. Our frequency inverters are therefore fitted as standard with an integrated EMC filter and an integrated brake unit. All part of being prepared for anything.

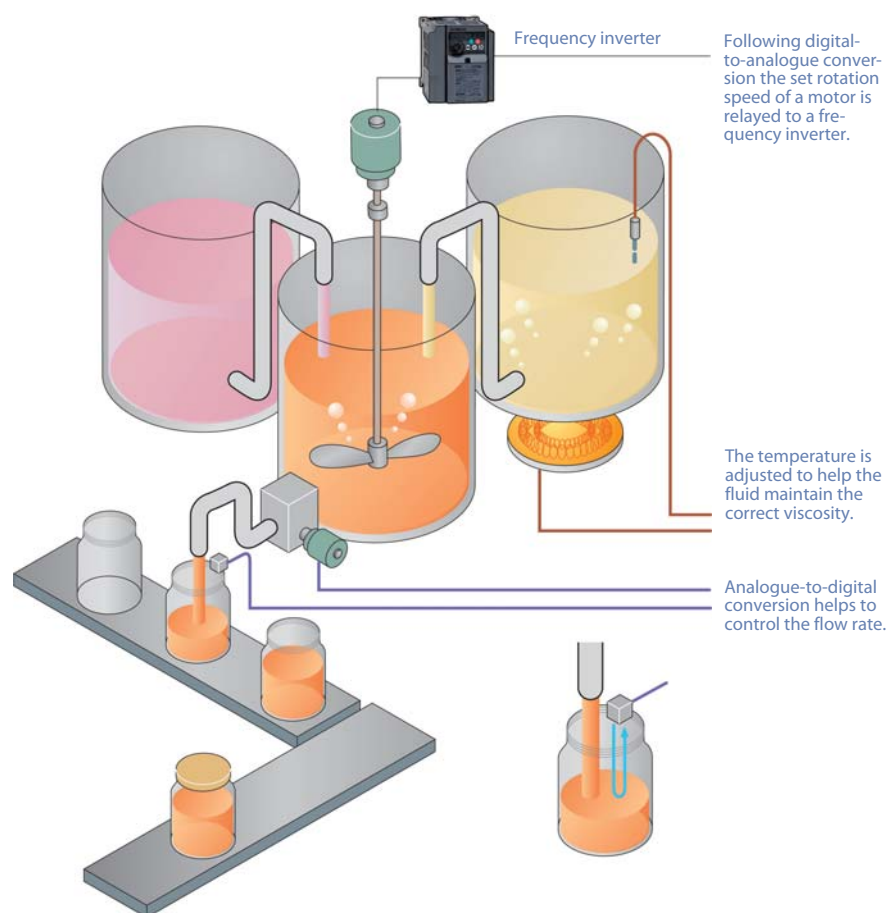


Saving where motors never stop, Mitsubishi Electric inverters work round the clock!

Rapid response times essential

Conveyor belts and stock logistics systems need constant speeds and velocities for rapid and systematic transportation of products. As such, the dynamic response generated by the drives needs to be the same when the conveyor belt is empty and when it is full. If there are sudden variations in load, e.g. caused by materials piling up in an uncontrolled way on the conveyor belt, then the drives need to react as quickly as possible in order to smooth the flow of materials.

Extreme cost efficiency



The conversion of analogue values is an important aspect of automation technology and facilitates process control.

Replacing conventional DC drives with modern three-phase drives will always mean one less cost-intensive maintenance chore. This in turn will mean far fewer drive failures which at worst bring the entire mixing or stirring machinery to a standstill.



Optimum energy efficiency, e.g. in complex pumping applications

Saving energy when starting and braking

The OEC technology (Optimum Excitation Control) developed by Mitsubishi Electric combines maximum drive efficiency with minimum power consumption. The only thing supplied to the connected motor is the magnetic flux which brings about the optimum degree of efficiency at all times. This leads to inordinate improvement in energy efficiency is achieved, particularly in the acceleration and braking phases.

Maximum efficiency is required from each individual drive in pump and fan applications as well as in mixers and stirrers.

In comparison with mechanical solutions, frequency inverters developed by Mitsubishi Electric are always able to tap the full potential when it comes to savings in energy consumption.

Potential savings

Too powerful and too expensive!

Energy costs are rising all the time. Over half of the power consumed in industry is accounted for by electric motors. Up to 96% of the life cycle costs of a motor are accounted for by energy costs. Unfortunately, when analysing costs, it is precisely this point which is paid precious little attention or is ignored altogether. The biggest potential source of savings is frequently disregarded.

For example, in order to guarantee that an air handling plant will run smoothly even at full load, which is seldom the case, and to have spare capacity for expansion the systems fans are often over specified. In some cases fans in these applications can be operating at an average efficiency of 65% or less.

In addition, in conventional systems the equipment is usually controlled by mechanical ventilation flaps which slashes efficiency levels, especially with medium loads. The flap control function can very easily be replaced by the use of frequency inverters and the power consumption reduced by 20 to 60%.

Result: wasted energy

Oversized fan, pump and motor systems combined with continuous operation at maximum capacity means many systems are operated at levels far below ideal in terms of efficiency. This leads to excess power consumption which can only really be explained by ignorance or poor practise.

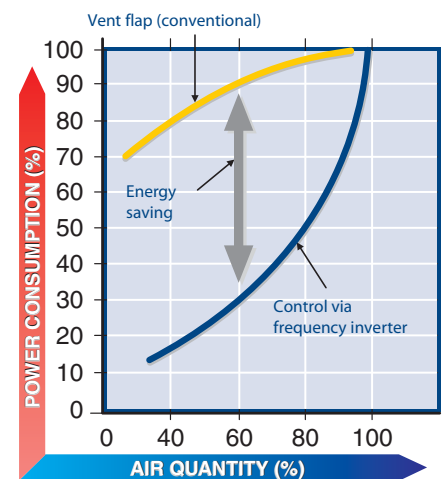


A Mitsubishi frequency inverter is a safe investment

Countermeasures

The power consumption of slow running motors can be reduced if the speed is controlled by changing the frequency. The frequency inverter allows the motor to be adjusted to the load. Frequency inverters which generate variable frequencies and voltage levels save energy, reduce wear on the motor and minimise wear and tear on the motor-driven assembly.

They also allow far greater flexibility when it comes to organising operating procedures.



Example: A motor controlled by a frequency inverter (blue line) is using the energy to extract air. The mechanically throttled motor doing the same task but operated directly on the mains (yellow line) is wasting a large amount of the energy.



Save on energy costs by investing in the Mitsubishi Electric family of inverters

A world of applications



Mitsubishi frequency inverters are used in a wide range of areas.

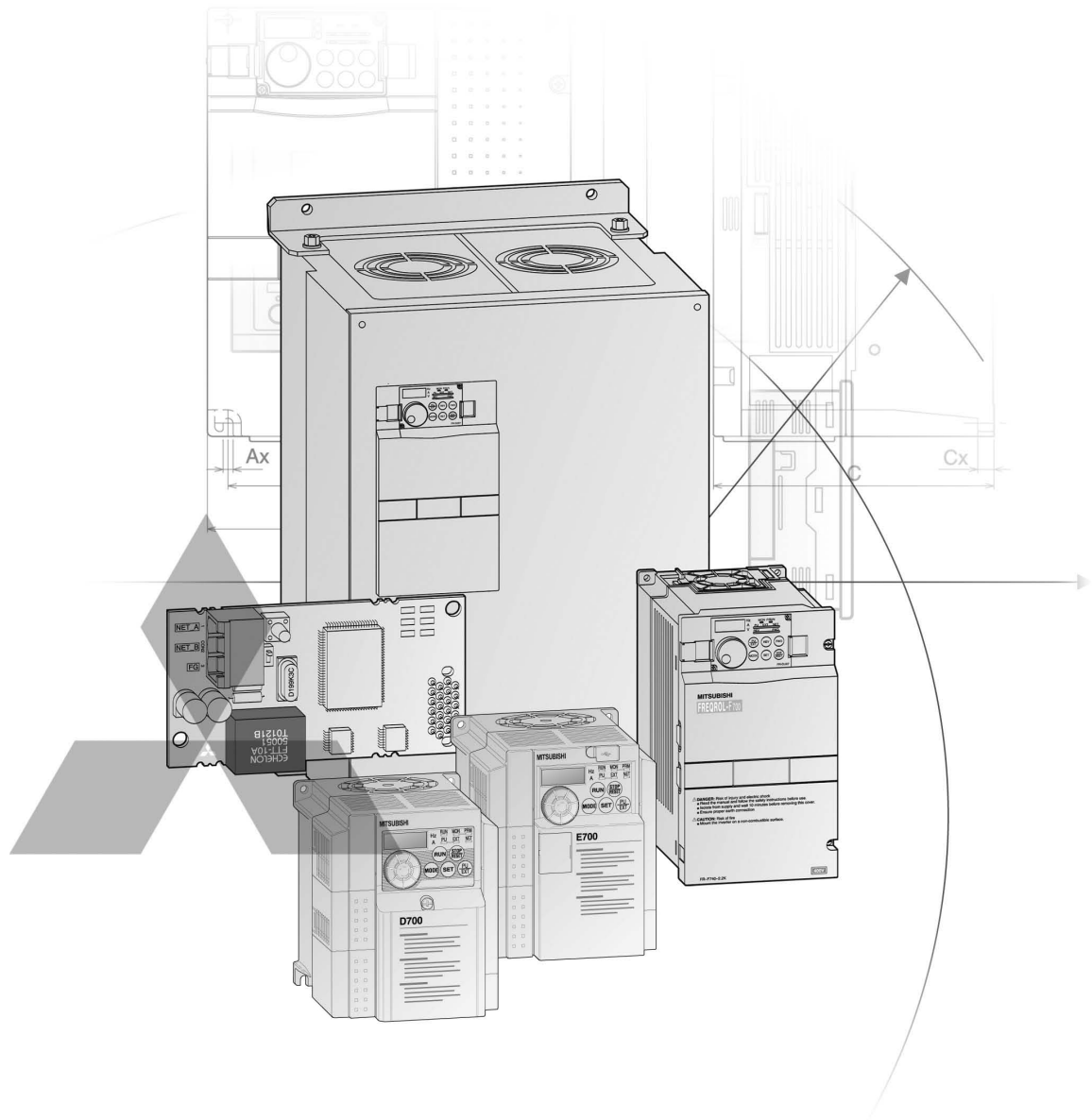
Mitsubishi Electric operates eight branches in Europe, where it has maintained a presence for more than 25 years and developed a constantly growing and far-extending network comprising links to other companies and reliable partnerships.

On the technical side, three manufacturing and automation centres form the basis of tailored automated solutions, further centres already being planned.

A Europe-wide network, the European Service Group (ESG), provides interfaces to experienced engineers and offers distributors support throughout every phase of the project.

Mitsubishi products are found in a variety of industrial, infrastructure and service sector contexts, ranging from critical applications in the pharmaceuticals industry to state-of-the-art leisure and entertainment facilities. Here are just a few examples of recent applications:

- Agriculture
 - Irrigation systems
 - Plant handling systems
 - Sawmills
- Building management
 - Smoke detection monitoring
 - Ventilation and temperature control
 - Lift (elevator) control
 - Automated revolving doors
 - Telephone management
 - Energy management
 - Swimming pool management
- Construction
 - Steel bridge manufacturing
 - Tunnel boring systems
- Food and drink
 - Bread manufacture (mixing/baking)
 - Food processing (washing/sorting/slicing/packaging)
- Leisure
 - Multiplex cinema projection
 - Animated mechatronics (museums/theme parks)
- Medical
 - Respiration machine testing
 - Sterilization
- Pharmaceutical/chemical
 - Dosing control
 - Pollution measurement systems
 - Cryogenic freezing
 - Gas chromatography
 - Packaging
- Plastics
 - Plastic welding systems
 - Energy management systems for injection moulding machines
 - Loading/unloading machines
 - Blow moulding test machines
 - Injection moulding machines
- Printing
- Textiles
- Transportation
 - Sanitation on passenger ships
 - Sanitation on rail rolling stock
 - Fire tender, pump management
 - Waste disposal truck management
- Utilities
 - Waste water treatment
 - Fresh water pumping



Technical Information Section

Further Publications within the Industrial Automation Range

Technical Catalogues

MELSERVO and Motion Controller Technical Catalogue

Product catalogues for servo motors and servo amplifiers of the MR-J series and Motion Controller with SSCNET connection

MELSEC PLC and HMI Technical Catalogue

Product catalogues for programmable logic controllers, operator terminals and accessories for the MELSEC PLC series

MELFA Robots Technical Catalogue

Product catalogue for Mitsubishi Electric industrial robots.

Further service supplies

This technical catalogue is designed to give an overview of the extensive range of the Mitsubishi Electric frequency inverters. If you cannot find the information you require in this catalogue, there are a number of ways you can get further details on configuration and technical issues, pricing and availability.

For technical issues visit the www.mitsubishi-automation.com website.

Our website provides a simple and fast way of accessing further technical data and up to the minute details on our products and services. Manuals and catalogues are available in several different languages and can be downloaded for free.

For technical, configuration, pricing and availability issues contact our distributors and partners.

Mitsubishi partners and distributors are only too happy to help answer your technical questions or help with configuration building. For a list of Mitsubishi Electric partners please see the back of this catalogue or alternatively take a look at the "contact us" section of our website.

About this technical catalogue

This catalogue is a guide to the range of products available. For detailed configuration rules, system building, installation and configuration the associated product manuals must be read. You must satisfy yourself that any system you design with the products in this catalogue is fit for purpose, meets your requires and conforms to the product configuration rules as defined in the product manuals.

Specifications are subject to change without notice. All trademarks acknowledged.

FREQUENCY INVERTERS

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Mitsubishi Electric Frequency Inverters

The great variety of the Mitsubishi Electric frequency inverter models makes it easy for the user to choose the optimum inverter for his application.

There are basically four different inverter series:

- FR-D700
- FR-E700
- FR-F700
- FR-A700

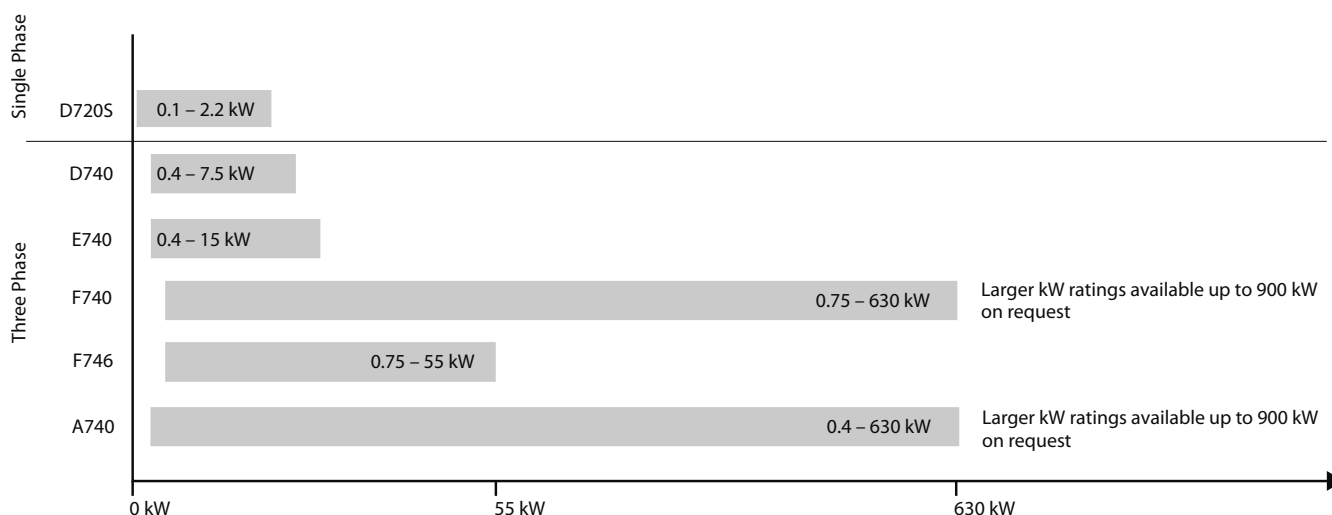
The inverters are available with an output range from 0.1 kW to 630 kW.

With most Mitsubishi Electric frequency inverters an overload capacity of 200 % is standard. This means they deliver double the performance of the competing inverters with the same rating. Mitsubishi Electric inverters also have active current limiting. This provides the perfect response characteristics of the current vector system and gives you the confidence you need for demanding drive applications.

The system instantly identifies over currents and limits them automatically with fast response, allowing the motor to continue operating normally at the current threshold.

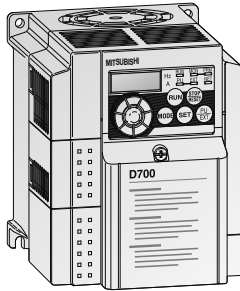
Mitsubishi Electric inverters are also able to communicate with industry standard bus systems like Ethernet TCP/IP, Profibus/DP, DeviceNet, CC-Link, CANopen, LON Network, RS 485/Modbus RTU making it possible to integrate frequency inverters as part of a complete automation system.

Mitsubishi Electric inverters are real energy savers achieving maximum drive capacity utilisation with minimum power consumption. Flux optimisation ensures that the connected motor only gets exactly the amount of magnetic flux required for optimum efficiency. This is particularly important at low speeds as motors are normally using a voltage/frequency control system.



Feature	FR-D700	FR-E700	FR-F700	FR-A700
Rated motor output range	0.1–7.5 kW	0.4–15 kW	0.75–630 kW	0.4–630 kW
Frequency range	0.2–400 Hz	0.2–400 Hz	0.5–400 Hz	0.2–400 Hz
Power supply	Single-phase, 200–240 V (-15 %/+10 %) Three-phase, 380–480 V (-15 %/+10 %)	Three-phase, 380–480 V (-15 %/+10 %)	Three-phase, 380–480 or 500 V (-15 %/+10 %)	Three-phase, 380–480 or 500 V (-15 %/+10 %)
Protection	IP 20	IP 20	FR-F700: IP 00/IP 20 FR-F746: IP 54	IP 00/IP 20
Special functions	<ul style="list-style-type: none"> • V/f control • Sensorless vector control • Brake transistor • Safety stop function conforming EN 954-1 Cat3 • Energy saving control (Optimum excitation control) • Maintenance timer 	<ul style="list-style-type: none"> • V/f control • Real sensorless vector control • Brake transistor • Safety stop function conforming EN 954-1 Cat3 • Torque limit • Ext. brake control • Flying start • Remote I/O • Maintenance timer 	<ul style="list-style-type: none"> • Traverse function • Switch motor to direct mains operation • Advanced PID function (multi pump function) • Regeneration avoidance function • Flying start • V/f control • Simple magnetic flux vector control • Life time diagnostics 	<ul style="list-style-type: none"> • Torque control • Position control • Real sensorless vector control • Closed loop vector control • Traverse function • Regeneration avoidance function • Integrated PLC function • Easy gain tuning • Life time diagnostics
Specifications	Refer to page 10	Refer to page 14	Refer to page 18	Refer to page 24

FR-D700 Ultra-compact Standard Inverters



The ultra compact FR-D700 series frequency converters excel through their very simple operation whilst still providing many functions.

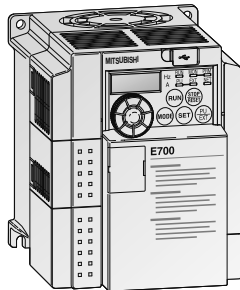
The spring clamp controller connections version enables simple and fast set-up of the frequency inverter.

The FR-D700 is equipped with a safety stop function. The small dimensions render the FR-D700 series frequency inverters ideal for use in restricted spaces. New functions such as intermediate circuit control of the output frequency, the

dancer roll control or the traverse function, facilitate universal use in numerous applications such as:

- Pumps
- Fans
- Presses
- Conveyor belts
- Industrial washing machines
- Automatic shelf systems

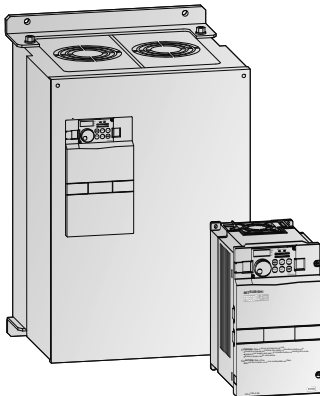
FR-E700 Compact Inverters



Improved functions and equipment features such as an integrated USB interface, an integrated "digital dial" with display, improved efficiency in the low speed range as well as the possibility of using one of many option cards such as the exchangeable I/O cards, for instance, render the FR-E700 a commercial universal genius for many applications, such as:

- Textile machines
- Door and gate actuators
- Elevators
- Cranes
- Material handling systems

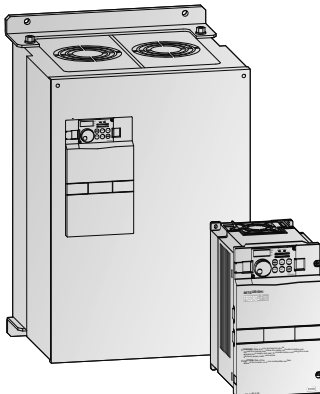
FR-F700 Energy Saving Inverters



Mitsubishi Electric's FR-F700 series is a range of frequency inverters with truly exceptional power conservation capabilities. The inverters of the FR-F740/FR-F746 series are ideal for pumps, ventilation fans and applications with reduced overload requirements such as:

- Air conditioning systems, e.g. in building management
- Air extraction systems
- Fans and blowers
- Hydraulics systems
- Compressors
- Sewage and drains systems
- Ground water pumps
- Heat pumps
- Drive systems with high idling rates

FR-A700 High End Inverters



The new FR-A700 frequency inverters combine innovative functions and reliable technology with maximum power, economy and flexibility.

The FR-A740 is the appropriate inverter for demanding drive tasks with requirements for high torque and excellent frequency precision. Its extensive functions allow adaption to many applications. The outstanding drive features of the FR-A740 suit various needs, like:

- Conveyor technology
- Chemical machines
- Winding machines
- Printing machines
- Cranes and lifting gear
- High-bay warehousing systems
- Extruders
- Centrifuges
- Machine tools

Intelligent Motor Control Functions

Compatible with many new applications

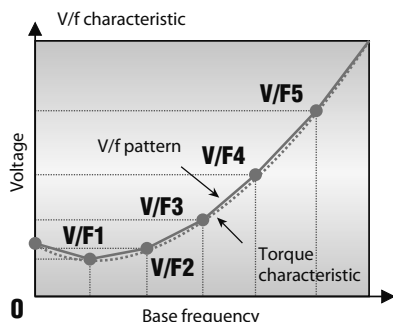
- PID control
The integrated PID control for example supports a flow control for pumps.
- Torque boost
Torque boost selection is possible.

Comprehensive protection functions for safe operation

- Built-in electronic overcurrent protection
- Selection of the protection function for automatic retry after alarm occurrence.

Flexible 5-point V/f curve

The integrated flexible 5-point V/f curve enables you to match the torque curve perfectly to the characteristics of your machine.



Magnetic flux vector control

The integrated flux vector control of the inverter system makes it possible to achieve high torques, even at low motor speeds.

The sensorless vector control system of the FR A700 series enables fast, high-precision speed and torque regulation, even when using general-purpose motors without an encoder.

When the FR-A7AP is mounted to the FR-A700, full-scale vector control operation can be performed using a motor with encoder. Fast response/high accuracy speed control (zero speed control, servo lock), torque control, and position control can be performed. Vector control offers excellent control characteristics when compared to V/F control and other control techniques, achieving the control characteristics equal to those of DC machines.

Compatible with numerous I/Os

- Multi-speed operation
(15 different pre-selected speeds are available)
- 0/4 to 20 mA and 0 to 5 V DC/ 0 to 10 V DC control input
- Multi-input terminals: selection of different input functions
- Multi-output terminals: selection of different output functions
- 24 V external power supply output (permissible values: 24 V DC/0.1 A)

Operating functions and other convenient functions

- Frequency jumps (three points) to avoid the machine's resonant frequency
- Fast acceleration/deceleration mode
- Full monitoring capabilities for monitoring actual operating time and much more
- User-selectable alternative configurations with up to three parameter sets
- Zero current detection

Second electronic thermal function

This function is used to rotate two motors of different rated currents individually by a single inverter.

Regeneration avoidance function

The regeneration avoidance function of the FR-F700 and FR-A700 can prevent the inverter from being shut down by regenerative overvoltages when strong regenerative loads cause power to be released into the frequency inverter (for example when braking the motor or with loads that actively drive the motor).

The inverter can automatically increase the output frequency or disable the braking ramp when a programmed threshold value is reached. The response sensitivity, dynamics and working range are all adjustable.

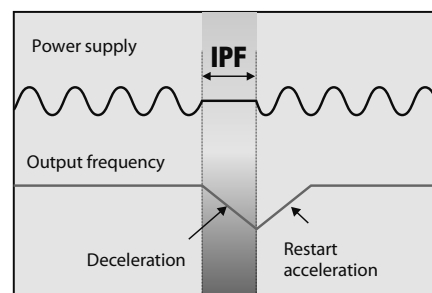
For example, this function can prevent a shutdown with an overvoltage error when the speed of a fan controlled by the inverter is increased by the draft from another fan operating in the same ventilation duct. The function then temporarily increases the output frequency above the setpoint value.

This function can also be used to brake loads with the DC bus voltage, without using braking modules.

Automatic restart after instantaneous power failures

In pump and fan applications normal operation can be continued automatically after brief power failures. The system simply re-activates the coasting motor and automatically accelerates it back up to its setpoint speed.

The graphic below shows how the frequency inverter can respond to a brief power outage. Instead of coasting down completely and stopping, the motor is automatically "caught" by the frequency inverter and re-accelerated back up to its previous speed.



Maintenance timer

The maintenance timer function can be used to monitor the service life of different components.

Communication

Extended I/Os for additional control functions

The following I/Os are included as standard equipment on the inverters. The number of I/Os depends on the inverter model.

- Contact inputs
- Analog inputs
- Open collector outputs
- Relay outputs
- Analog outputs

The contact inputs, open collector outputs and relay outputs can all be used for a wide range of functions.

The switching status of the input and output terminals can be displayed on the control panel.

In addition the FR-A700 is equipped with a pulse input for positioning.

Remote I/Os

Instead of using the remote I/Os of a PLC you can use a network connection to read out the status of the frequency inverter's inputs and set its outputs.

Expansion slot

The frequency inverter has up to 3 expansion slots (except FR-D700) that can be used to install an I/O expansion module or a network module. These modules are cards that are installed by plugging them into the slot of the inverter.

Communications capability as a standard function

An RS485 interface for data communications is standard equipment of all inverters. The interface serves for data exchange for example with a personal computer.

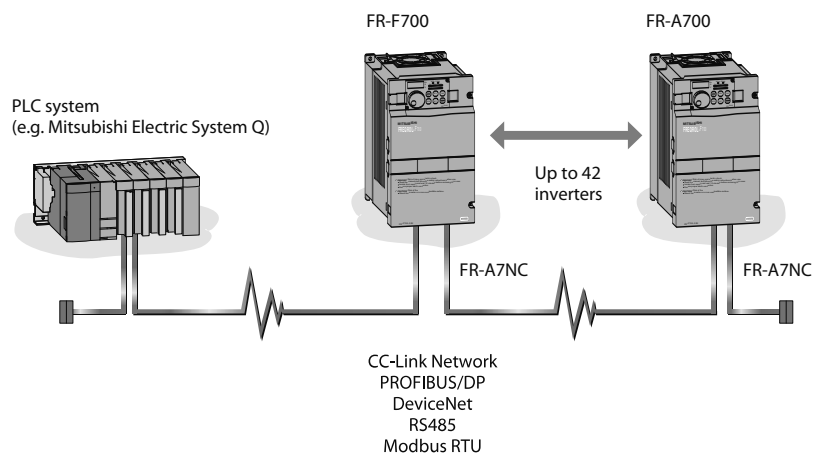
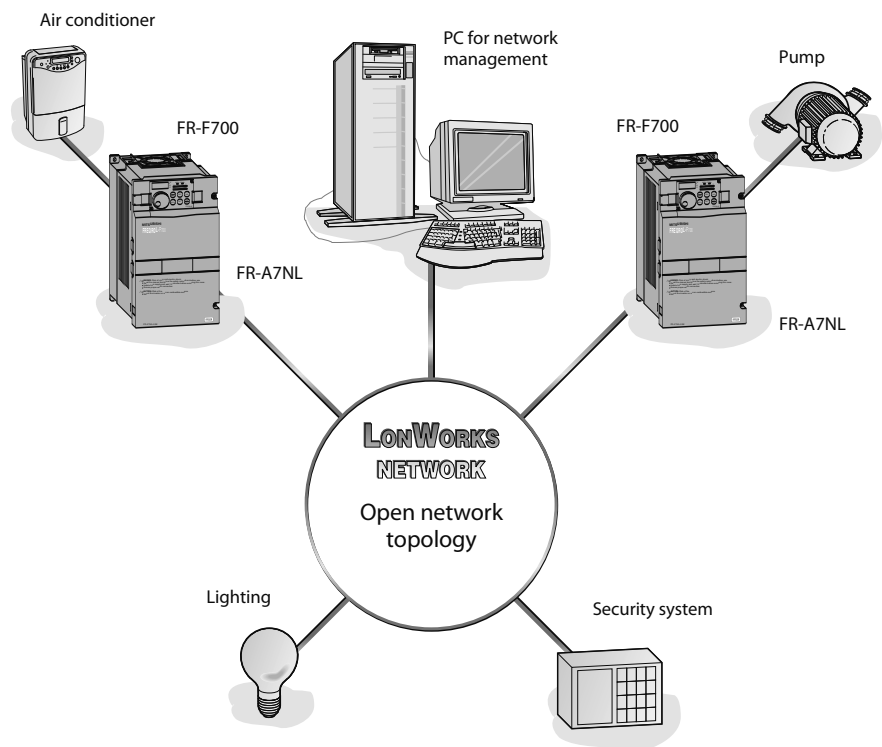
Support for integration in larger networks

Open communications with standard industrial bus systems can be implemented easily with optional expansion cards (except FR-D700).

This makes it possible to integrate the frequency inverter in large-scale automation systems.

The following networks are supported by the inverters:

- CC-Link
- LON Works
- Profibus/DP
- DeviceNet
- CANopen
- RS485
- Modbus RTU as standard
- USB (FR-E700/FR-A700)
- SSCNET III (FR-A700)
- Ethernet (FR-A700)



User-friendly Operation

Easy configuration with parameter unit or software

The parameter unit FR-DU07 is included as standard equipment with the inverters FR-F700 and FR-A700. The FR-D700 and FR-E700 are equipped with an integrated operation panel. All these panels use a digital dial for making the settings. For the FR-D700 and FR-E700 the parameter unit FR-PA07 is optional.

The parameter unit makes operation of the inverter simple and intuitive and displays operating parameters and alarm messages. The integrated digital dial control provides fast and efficient access to all key drive parameters.

The optional FR-PU07 parameter unit features a long-life LC display with a backlight and integrated numeric keypad for direct entry of operating parameters. The user interface can be displayed in eight different languages. This panel is designed as a remote unit that is connected to the inverter with a cable. For FR-F700/FR-A700 inverters a fixed installation is also possible. It also supports definition of user groups. Editable parameter sets can be implemented, which can be selected according to specific application requirements.



FR-DU07

In addition to parameter unit operation the frequency inverter can also be connected to a standard PC via an RS485 port and operated from the PC with the FR-Configurator. Using this software you can configure, operate and monitor multiple frequency inverters, either in a network or directly from a single PC or notebook computer.



FR-PU07

User-friendly

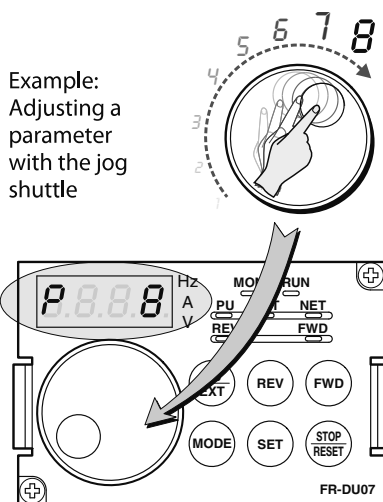
In addition to allowing you to enter and display configuration and control parameters the integrated operation panel can also be used to monitor and display current operating data and alarm messages. The information is output on a 4-digit LED display.

You can monitor all the current status parameters of both the inverter itself and the connected motor. Problems and malfunctions are indicated by error codes.

One-touch operation

Simple and intuitive configuration and operation save time and money. The control panel's jog shuttle "digital dial" control provides much faster access to all key drive parameters than would be possible with conventional buttons and keys.

You can also use the dial to continuously adjust the speed of the connected motor.



Example:
Adjusting a parameter with the jog shuttle

Removable panel with parameter copy function

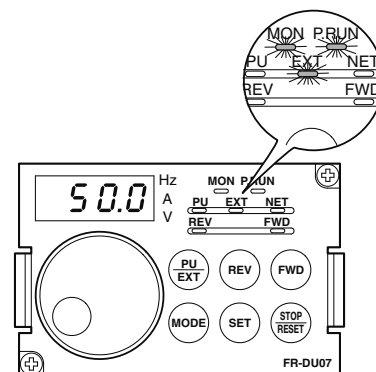
The control panel (except for FR-D700/FR-E700) is removable and can also be connected installed remotely, for example in the door of a switchgear cabinet. It also features a useful copy function with which you can copy the parameter settings of one frequency inverter to another.

Alarm log

The control panel stores an alarm log for up to 8 alarm messages that can be displayed and checked on the panel. The alarm details in the log include frequency, current, voltage and cumulative operating time at the time of the alarm.

Switch between direct and external control

The frequency inverter can be controlled directly via the operation panel (PU mode) or via external signals (EXT mode).



Maintenance and Standards

Simplified Maintenance

Easy installation and maintenance

Since the control and power terminal block is easy to access, the installation and maintenance of the inverter is also very easy.

All connection points are designed as screw terminals or spring clamps (FR-D700). The housing includes a cable routing facility which can be removed for installing.

Easy access to cooling fans

The easily accessible cooling fans can be replaced quickly and easily, if required. The integrated cooling fan can be switched OFF automatically in stand-by operation to increase its lifetime significantly.

Service timer

The frequency inverters all have an integrated service timer that automatically triggers an alarm after a set number of operating hours. This feature can be used for monitoring the frequency inverter itself or a peripheral component. The values of the mean output current and the service timer can also be output as analog signals.

Modern diagnostics functions further extend service life

The ageing of the main circuit capacitors, the control circuit power capacitor, the internal cooling fans and the inrush current limiter circuit can be checked with the monitoring functions.

If the inrush resistor overheats an alarm is displayed.

The alarms for the main circuit capacitors, control circuit capacitor, inrush current limiter and internal fans can all be output to a network or via the optional FR-A7AY module.

This makes it possible to prevent malfunctions by configuring diagnostics alarms to be triggered when the end of the service life is reached.

The inverter also has an internal program that can evaluate the ageing of the main circuit capacitors. This feature is only available when a motor is connected to the inverter.

Environment-Friendly and International Compliance

Electromagnetic compatibility

Latest technologies have been used to significantly reduce the interference levels generated by this frequency inverter.

Regarding its electromagnetic compatibility the frequency inverters comply with the European EMC directives.

To meet these standards noise filters have been developed for each performance range.

The FR-F700 and FR-A700 conform to the strict electromagnetic compatibility regulations of the European Union (EMC Directive, Environment 2, EN 61800-3).

In order to meet these standards the inverters are fitted with a new, integrated interference suppression filter, which can easily be deactivated with a jumper if necessary.

You can also further limit the make current and reduce network interference by fitting the input of the inverter with an optional AC choke and a DC reactor, which is connected to special terminals on the inverter unit.

Circuit boards with two coats of protective varnish

The frequency inverters with the E1 designation (standard, type 01800 and above) have circuit boards with two coats of protective varnish.

This feature is available as an option for the models up to type 01160. The twin coating on the internal PCBs provides even better protection against environmental influences. This is particularly important in applications sewage plants where the switchgear cabinets are exposed to aggressive fermentation gases that can reduce the service life of the equipment.

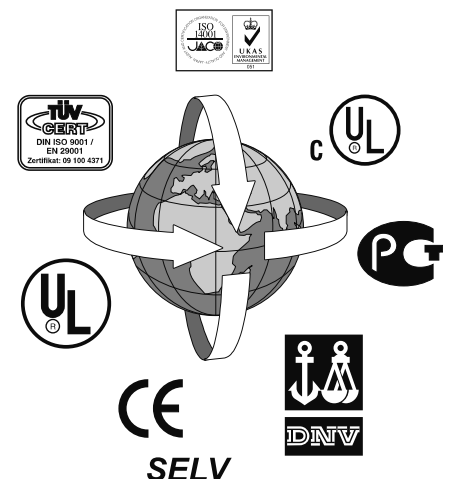
International standards

The inverters are designed so that they can be used worldwide without any additional modifications or certifications.

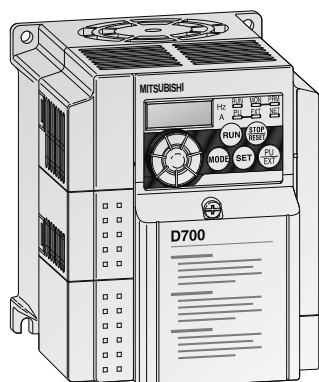
- The units conform to the international standards CE, UL, cUL, Gost, CCC, ISO 9001 and ISO 14001. In addition the series FR-F700 and FR-A700 conform to DNV standards.
- User-selectable positive or negative switching logic. Users can select positive or negative switching logic for input and output signals, enabling flexible and simple adaptation of the units for varying world market requirements.

- Multilingual programming/control unit (optional)
- Support for a variety of international industrial bus systems
- Internationally standardised, frequency inverter configuration software package for MS Windows, with multilingual user interface

These features make the inverters a truly international product that meets all relevant standards and can be easily adjusted for national requirements.



The FR-D700 Series



The FR-D700 is a pace-setter in the miniature drive system class. It features ultra-compact dimensions, simple and secure operation and a wide range of technology functions. The integrated jog shuttle control gives the user fast, direct access to all important drive parameters.

Output range:

0.1–7.5 kW,
200–240 V/380–480 V

Available accessories:

Optional control units, versatile options and useful accessories are available for this frequency inverter.

Please refer to page 35 for details.

Technical Details FR-D700

Product line			FR-D720S EC						FR-D740 EC						
			008	014	025	042	070	100	012	022	036	050	080	120	160
Output	Rated motor capacity ^①	kW	0.1	0.2	0.4	0.75	1.5	2.2	0.4 (0.55)	0.75 (1.1)	1.5 (2.2)	2.2 (3)	3.7 (4)	5.5 (7.5)	7.5 (11)
	Rated output capacity ^②	kVA	0.3	0.5	1.0	1.6	2.8	3.8	1.2	2.0	3.0	4.6	7.2	9.1	13.0
	Rated current ^③	A	0.8	1.4	2.5	4.2	7.0	10.0	1.2 (1.4)	2.2 (2.6)	3.6 (4.3)	5.0 (6.0)	8.0 (9.6)	12.0 (14.4)	16.0 (19.2)
	Overload capacity ^④		150 % of rated motor capacity for 60 s; 200 % for 0.5 s												
	Voltage ^⑤		3-phase, 0 V up to power supply voltage												
Input	Power supply voltage		1-phase, 200–240 V AC, -15 %/+10 %						3-phase, 380–480 V AC, -15 %/+10 %						
	Voltage range		170–264 V AC at 50/60 Hz						325–528 V AC at 50/60 Hz						
	Frequency range		50/60 Hz ± 5 %												
	Rated input capacity ^⑥	kVA	0.5	0.9	1.5	2.3	4.0	5.2	1.5	2.5	4.5	5.5	9.5	12	17
Control	Control method		V/f control, optimum excitation control or general-purpose magnetic flux vector control												
	Modulation control		Sine evaluated PWM, Soft PWM												
	PWM switching frequency		0.7–14.5 kHz, user adjustable												
	Frequency range	Hz	0.2–400												
	Frequency resolution	Analog	0.06 Hz/0–50 Hz (terminal 2, 4: 0–10 V/10 Bit) 0.12 Hz/0–50 Hz (terminal 2, 4: 0–5 V/9 Bit) 0.06 Hz/0–50 Hz (terminal 4: 0–20 mA/10 Bit)												
		Digital	0.01 Hz												
	Frequency precision		±1 % of max. output frequency (temperature range 25 °C ± 10 °C) during analog input; ±0.01 % of max. output frequency during digital input (set via Digital Dial)												
	Voltage/frequency characteristics		Base frequency adjustable from 0 to 400 Hz Constant torque/variable torque pattern can be selected												
	Possible starting torque		≥ 150 %/1 Hz (for vector control oder slip compensation)												
	Torque boost		Manual torque boost												
	Acceleration/deceleration time		0.1 to 3600 s (may be set individually for acceleration and deceleration)												
	Acceleration/deceleration characteristics		Linear or S-pattern acceleration/deceleration mode selectable												
	Braking torque	DC braking	Operating frequency: 0–120 Hz, operating time: 0–10 s, voltage: 0–30 % (externally adjustable)												
	Current stall prevention operation level		Operation current level setting 0–200 %, user adjustable												
Motor protection		Electronic motor protection relay (rated current user adjustable)													

Remarks:

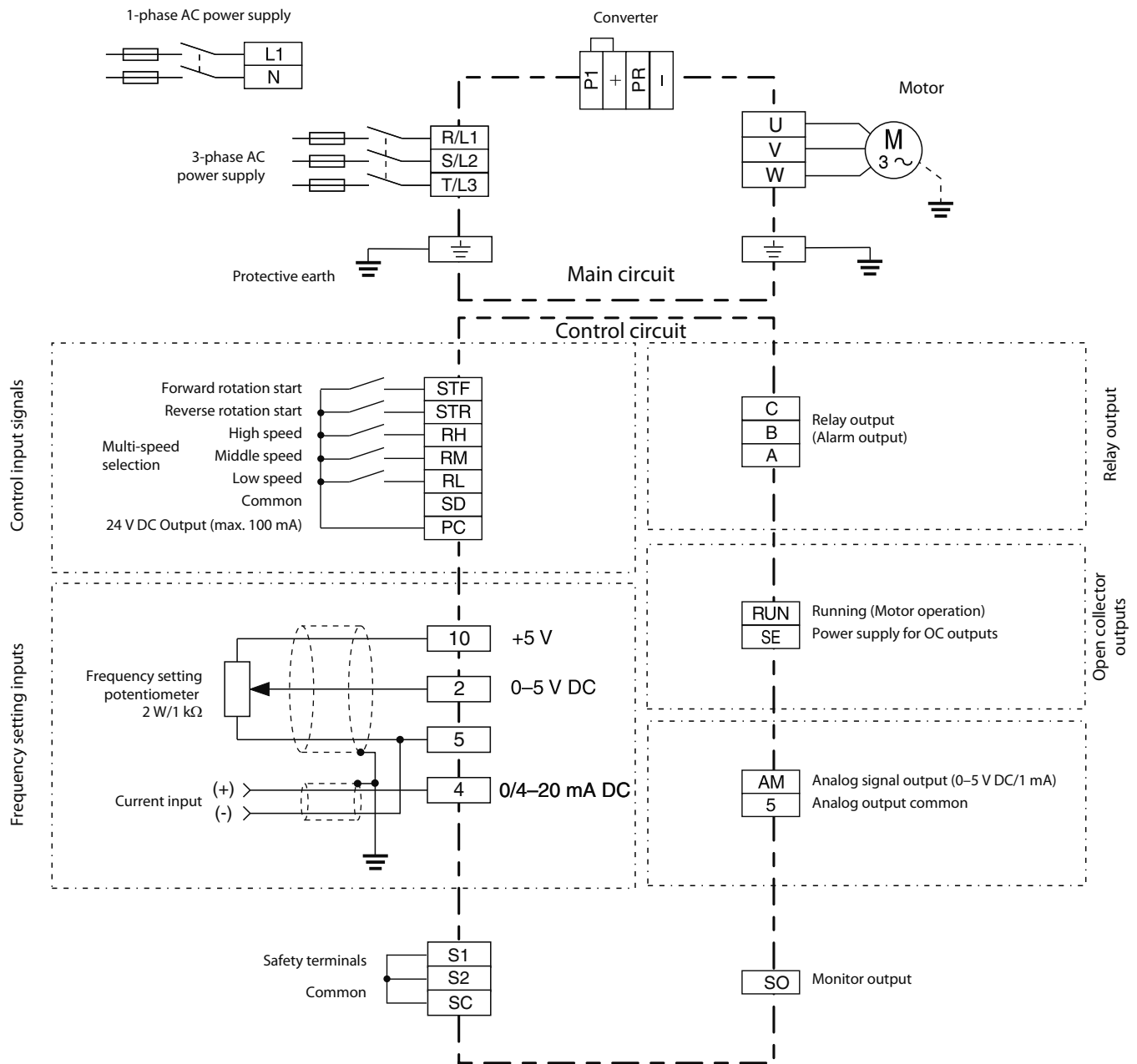
Explanation for ① to ⑥ see next page.

Product line			FR-D720S EC						FR-D740 EC						
			008	014	025	042	070	100	012	022	036	050	080	120	160
Control signals for operation	Frequency setting signal	Analog input	Terminal 2: 0–5 V DC, 0–10 V DC Terminal 4: 0–5 V DC, 0–10 V DC, 0/4–20 mA												
		Digital input	Entered from operation panel or parameter unit. Frequency setting increment is selectable.												
	Operation functions	Maximum/minimum frequency setting, frequency jump operation, external thermal relay input selection, automatic restart after instantaneous power failure operation, forward/reverse rotation prevention, remote setting, second function, multi-speed operation, regeneration avoidance, slip compensation, operation mode selection, offline auto tuning function, PID control, computer link operation (RS485), optimum excitation control, power failure stop, speed smoothing control, Modbus-RTU													
Control signals for operation	Input signals	Any of 5 signals can be selected using parameters 178 to 182 (input terminal function selection): multi-speed selection, remote setting, second function selection, terminal 4 input selection, JOG operation selection, PID control valid terminal, external thermal input, PU-external operation switchover, V/F switchover, output stop, start self-holding selection, traverse function selection, forward rotation, reverse rotation command, inverter reset, PU-NET operation switchover, external-NET operation switchover, command source switchover, inverter operation enable signal, and PU operation external interlock													
	Output signals	Operating status	Can be selected using parameters 190 and 192 (output terminal function selection): inverter operation, up-to-frequency, overload alarm, output frequency detection, regenerative brake prealarm, electronic thermal relay function prealarm, inverter operation ready, output current detection, zero current detection, PID lower limit, PID upper limit, PID forward/reverse rotation output, fan alarm, heatsink overheat pre-alarm, deceleration at an instantaneous power failure, PID control activated, PID output interruption, during retry, life alarm, fault output 3, current average value monitor, maintenance timer alarm, remote output, alarm output, fault output												
		Analog signal	0–10 V DC												
Display option	Displays on operation panel or parameter unit (FR-PU07)	Operating status	Output frequency, motor current (steady), output voltage, frequency setting, cumulative energization time, actual operation time, converter output voltage, regenerative brake duty, electronic thermal relay function load factor, output current peak value, converter output voltage peak value, motor load factor, PID set point, PID measured value, PID deviation, inverter I/O terminal monitor, output power, cumulative power, motor thermal load factor, inverter thermal load factor, PTC thermistor resistance.												
		Alarm display	Fault definition is displayed when the fault occurs and the past 8 fault definitions (output voltage/current/frequency/cumulative energization time right before the fault occurs) are stored.												
	Additional displays on parameter unit FR-PU07	Operating status	Not used												
		Interactive guidance	Interactive guide for operation and troubleshooting via help function												
Protection	Functions	Overcurrent during acceleration, overcurrent during constant speed, overcurrent during deceleration, overvoltage during acceleration, overvoltage during constant speed, overvoltage during deceleration, inverter protection thermal operation, motor protection thermal operation, heatsink overheat, input phase failure ②, output side earth (ground) fault overcurrent at start ③, output phase failure, external thermal relay operation ④, PTC thermistor operation ⑤, parameter error, PU disconnection, retry count excess ⑥, CPU fault, brake transistor alarm, inrush resistance overheat, analog input error, stall prevention operation, output current detection value exceeded													
	Protective structure	IP 20													
Others	Cooling		Self-cooling				Fan cooling		Self-cooling		Fan cooling				
	Power loss	W	14	20	32	50	80	110	40	55	90	100	180	240	280
	Weight	kg	0.5	0.6	0.9	1.1	1.5	1.9	1.2	1.2	1.3	1.4	1.5	3.1	3.1
	Dimensions (W × H × D)	mm	68 × 128 × 80.5		68 × 128 × 142.5	68 × 128 × 162.5	108 × 128 × 155	140 × 150 × 145	108 × 128 × 129.5		108 × 128 × 135.5	108 × 128 × 155.5	108 × 128 × 165.5	220 × 150 × 155	
Order information		Order no.	214189	214190	214191	214192	214193	214194	212414	212415	212416	212417	212418	212419	21420

Remarks:

- ① The applied motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi 4-pole standard motor. The motor capacity ratings in brackets are for ambient temperatures up to 40 °C.
- ② The specifications of the rated output capacity are related to a motor voltage of 440 V.
- ③ The rated output current in brackets are for ambient temperatures up to 40 °C.
- ④ The % value of the overload capacity indicated is the ratio of the overload current to the inverter's rated output current. For repeated duty, allow time for the inverter and motor to return to or below the temperatures under 100 % load.
- ⑤ The maximum output voltage does not exceed the power supply voltage. The maximum output voltage can be changed within the setting range. However, the pulse voltage value of the inverter output side voltage remains unchanged at about $\sqrt{2}$ that of the power supply.
- ⑥ The power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and cables).
- ⑦ This protective function is available with the three-phase power input specification model only.
- ⑧ This protective function does not function in the initial status.


Block Diagram FR-D700



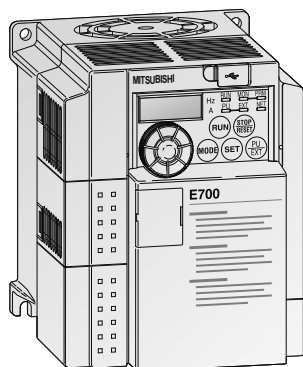
Assignment of Signal Terminals

Function	Terminal	Designation	Description
Control connection	STF	Forward rotation start	The motor rotates forward, if a signal is applied to terminal STF. If the signals STF and STR are applied simultaneously, the STOP command is given.
	STR	Reverse rotation start	The motor rotates reverse, if a signal is applied to terminal STR. If the signals STF and STR are applied simultaneously, the STOP command is given.
	RH, RM, RL	Multi-speed selection	Preset of 15 different output frequencies; programmable.
Common	SD	Contact input common (sink) 24 V DC power supply common	A determined control function is activated, if the corresponding terminal is connected to the terminal SD (sink logic). The SD terminal is isolated from the digital circuits via optocouplers. When connecting the transistor output (open collector output), such as a programmable controller (PLC), connect the negative external power supply for transistor output to this terminal to prevent a malfunction caused by undesirable currents. When source logic has been selected, connect this terminal with 0 V of the external power supply.
	PC	Contact input common (source) 24 V DC power supply	24 V DC/0.1 A output In sink logic, when activated by open collector transistors (e.g. PLC) the positive pole of an external power supply has to be connected to the PC terminal. In source logic, the PC terminal serves as common reference point for the control inputs.
Setting value specification	10	Voltage output for potentiometer	Output voltage 5 V DC. Max. output current 10 mA Recommended potentiometer: 1 k Ω , 2 W linear (multi-turn potentiometer)
	2	Input for frequency setting value signal	The voltage setting value 0–5 (10) V is applied to this terminal. The voltage range is preset to 0–5 V. The input resistance is 10 k Ω \pm 1k Ω . The maximum permitted voltage is 20 V DC.
	5	Reference point for frequency setting value signal	Terminal 5 is the reference point for all analog setting values and for the analog output signal AM. The terminal is isolated from the reference potential of the control circuit and should not be earthed for reasons of noise immunity.
	4	Input for current setting value signal	Inputting 4–20 mA DC (or 0–5 V, 0–10 V) provides the maximum output frequency at 20 mA and makes input and output proportional. This input signal is valid only when the AU signal is on (terminal 2 input is invalid). Use Pr. 267 to switch from among input 4 to 20 mA (initial setting), 0–5 V DC and 0–10 V DC. Set the voltage/current input switch in the "V" position to select voltage input (0–5 V/0–10 V).
Signal outputs	A, B, C	Relay output (alarm output)	The alarm is output via relay contacts (C-B = Normally Open, C-A = Normally Closed). The maximum contact load is 230 V AC/0.3 A or 30 V DC/0.3 A.
	RUN	Signal output for motor operation	Switched low (voltage of terminal SE is output) when the inverter output frequency is equal to or higher than the starting frequency (initial value 0.5 Hz). Switched high during stop or DC injection brake operation. (Low indicates that the open collector output transistor is on (conducts). High indicates that the transistor is off (does not conduct).) Permissible load 24 V DC (maximum 27 V DC)/0.1A (a voltage drop is 3.4 V maximum when the signal is on).
	SE	Reference potential for signal outputs	Reference potential for the signal RUN. This terminal is isolated from the reference potential of the control circuit 5 and SD.
	AM	Analog voltage output	Select one e.g. output frequency from monitor items. Not output during inverter reset. The output signal is proportional to the magnitude of the corresponding monitoring item. Output item (initial setting): Output frequency Output signal 0–10 V DC. Permissible load current 1 mA (load impedance 10 k Ω or more), resolution 8 bit
Interface	—	PU connector (RS485)	Communications via RS485
Manufacturer settings	S1, S2	Safety inputs	
	SC	Reference potential for safety inputs	Keep these open. Otherwise, the inverter may be damaged. Do not remove wires for shorting across terminal S1 and SC, across terminal S2 and SC. If one of these wires is removed, the inverter cannot be operated.
	S0	Safety monitor output	

Assignment of Main Circuit Terminals

Function	Terminal	Designation	Description
Main circuit connection	L1, N	Power supply 1-phase	Connect to the commercial power supply.
	R/L1, S/L2, T/L3	Power supply 3-phase	Keep these terminals open when using the high power factor converter (FR-HC) or power regeneration common converter (FR-CV).
	+, –	External brake unit connection	Connect the brake unit (FR-BU2), power regeneration common converter (FR-CV) or high power factor converter (FR-HC).
	+, P1	DC reactor connection	An optional DC reactor can be connected to the terminals P1 and +. Before connecting the DC reactor, disconnect the jumper from terminals P1 and +.
	+, PR	External brake resistor connection	Connect a brake transistor (FR-ABR, MRS) across terminals + and PR. (The brake resistor can not be connected to the FR-D720S-008 and 014.)
	U, V, W	Motor connection	Voltage output of the inverter (3-phase, 0 V up to input voltage, 0.2–400 Hz)
		PE	Protective earth connection of inverter

The FR-E700 Series



The FR-E700 series with SLV control sets new standards for compact vector-controlled drive systems. The inverters of the FR-E700 series are exceptionally versatile and powerful, packed with advanced features like the Soft PWM system for reducing motor noise, adjustable torque limiting, automatic motor configuration and an integrated brake resistor.

Output range:

0.4–15 kW,
380–480 V AC

Available accessories:

Optional control units, versatile options and useful accessories are available for this frequency inverter.

Please refer to page 35 for details.

Technical Details FR-E700

Product line			FR-E740 EC								
			016	026	040	060	095	120	170	230	300
Output	Rated motor capacity ^①	kW	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15
	Rated output capacity ^②	kVA	1.2	2.0	3.0	4.6	7.2	9.1	13	17.5	23.0
	Rated current ^③	A	1.6 (1.4)	2.6 (2.2)	4.0 (3.8)	6.0 (5.4)	9.5 (8.7)	12	17	23	30
	Overload capacity ^④		200 % of rated motor capacity for 3 s; 150 % for 60 s								
	Voltage ^⑤		3-phase, 0 V up to power supply voltage								
Input	Power supply voltage		3-phase, 380–480 V AC, -15 %/+10 %								
	Voltage range		323–528 V AC at 50/60 Hz								
	Frequency range		50/60 Hz ±5 %								
	Rated input capacity ^⑥	kVA	1.5	2.5	4.5	5.5	9.5	12	17	20	28
Control specifications	Control method		V/f control, optimum excitation control, general-purpose magnetic flux vector control or advanced magnetic flux vector control								
	Modulation control		Sine evaluated PWM, Soft PW								
	Carrier frequency		0.7–14.5 kHz (user adjustable)								
	Frequency range	Hz	0.2–400								
	Frequency resolution	Analog	0.06 Hz/0–50 Hz (terminal 2, 4: 0–10 V/10 Bit) 0.12 Hz/0–50 Hz (terminal 2, 4: 0–5 V/9 Bit) 0.06 Hz/0–50 Hz (terminal 4: 4–20 mA/10 Bit)								
		Digital	0.01 Hz								
	Frequency precision		±0.5 % of max. output frequency (temperature range 25 °C±10 °C) during analog input; ±0.01 % of max. output frequency during digital input								
	Voltage/frequency characteristics		Base frequency adjustable from 0 to 400 Hz; Constant torque/variable torque pattern can be selected								
	Possible starting torque		≥ 200 %/0.5 Hz when advanced magnetic flux vector control is set (3.7 K or less)								
	Torque boost		Manual torque boost; selectable between 0–30 %								
	Acceleration/deceleration time		0.01 to 3600 s individual settings								
	Acceleration/deceleration characteristics		Linear or S-form course, user selectable								
	Braking torque	DC braking	Braking time and braking moment adjustable, Operating frequency: 0–120 Hz, operating time: 0–10 s, voltage: 0–30 %								
	Current stall prevention operation level		Response threshold 0–200 %, user adjustable								
	Motor protection		Electronic motor protection relay (rated current user adjustable)								

Remarks:

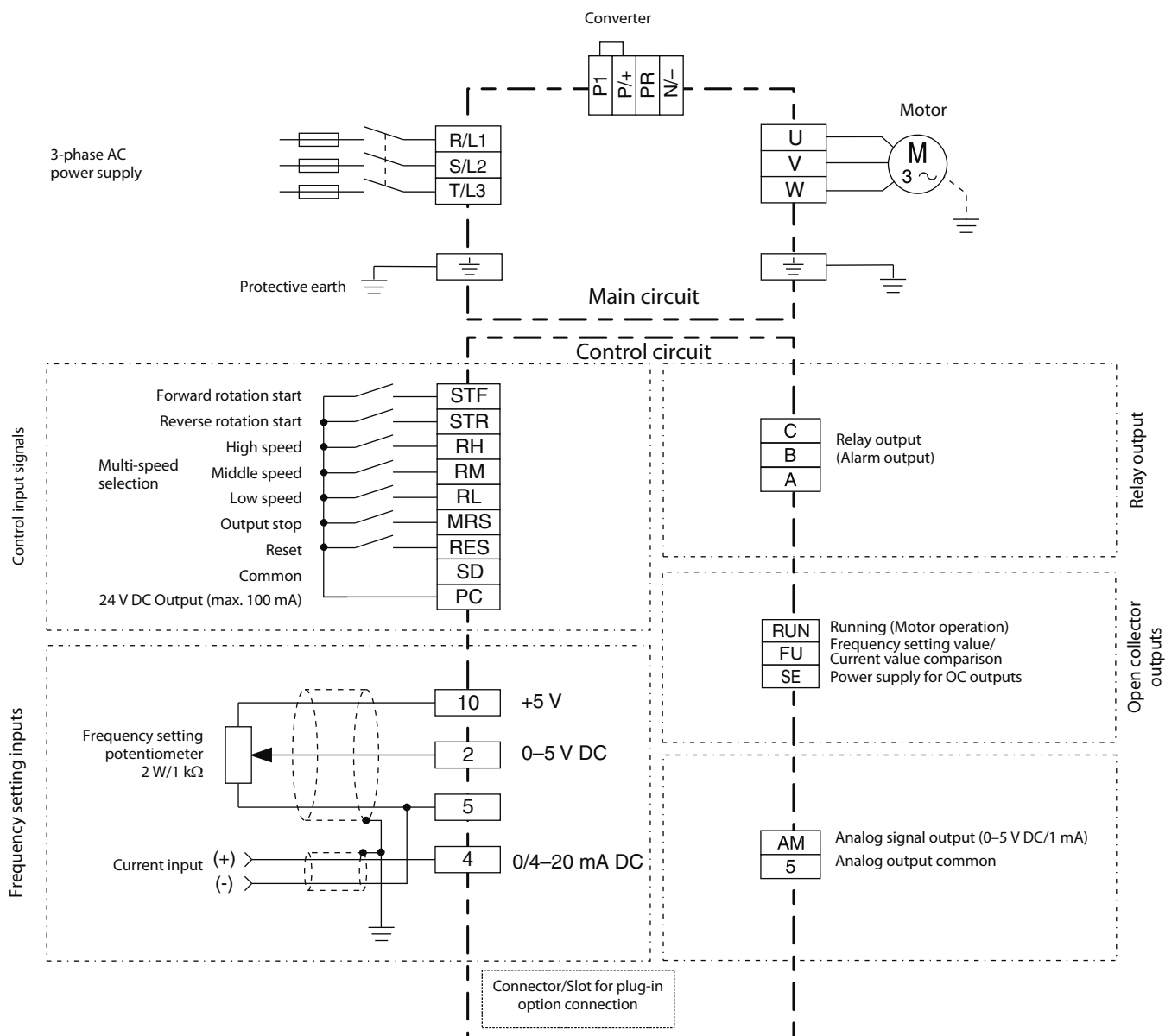
Explanation for ① to ⑥ see next page.

Product line			FR-E740 EC								
			016	026	040	060	095	120	170	230	300
Control signals for operation	Frequency setting values	Analog input	Terminal 2: 0–5 V DC, 0–10 V DC Terminal 4: 0–5 V DC, 0–10 V DC, 0/4–20 mA								
		Digital input	From operation panel or parameter unit								
	Input signals	Any of 7 signals can be selected using parameters 178 to 184 "Input terminal function selection": multi-speed selection, remote setting, stop-on contact selection, second function selection, terminal 4 input selection, JOG operation selection, PID control valid terminal, brake opening completion signal, external thermal input, PU-external operation switchover, V/f switchover, output stop, start self-holding selection, forward rotation, reverse rotation command, inverter reset, PU-NET operation switchover, external-NET operation switchover, command source switchover, inverter operation enable signal, and PU operation external interlock									
		Operation functions	Maximum/minimum frequency setting, frequency jump operation, external thermal relay input selection, automatic restart after instantaneous power failure operation, forward/reverse rotation prevention, remote setting, brake sequence, second function, multi-speed operation, stop-on contact control, droop control, regeneration avoidance, slip compensation, operation mode selection, offline auto tuning function, PID control, computer link operation (RS485)								
	Output signals	Operating status	Selection can be made from inverter operation, up-to-frequency, overload alarm, output frequency detection, regenerative brake prealarm, electronic thermal relay function prealarm, inverter operation ready, output current detection, zero current detection, PID lower limit, PID upper limit, PID forward/reverse rotation output, brake opening request, fan alarm, heatsink overheat pre-alarm, deceleration at an instantaneous power failure, PID control activated, during retry, life alarm, current average value monitor, remote output, alarm output, fault output, fault output 3, and maintenance timer alarm using Pr. 190 to Pr. 192 "Output terminal function selection".								
		Analog signal	0–10 V DC								
Display option	Display on the operation panel or parameter unit FR-PU07	Operating status	Output frequency, motor current, output voltage, frequency setting value, operation speed								
		Alarm display	Error messages are displayed after a protective function is activated. Up to 4 error codes can be stored.								
	Additional displays on parameter unit FR-PU07	Operating status	Not used								
		Interactive operating guide	Interactive guide for operation and troubleshooting via help function								
Protection	Functions	Overcurrent during acceleration, overcurrent during constant speed, overcurrent during deceleration, overvoltage during acceleration, overvoltage during constant speed, overvoltage during deceleration, inverter protection thermal operation, motor protection thermal operation, heatsink overheat, input phase failure, output side earth (ground) fault overcurrent at start, output phase failure, external thermal relay operation ^② , option fault, parameter error, internal board fault, PU disconnection, retry count excess ^② , CPU fault, brake transistor alarm, inrush resistance overheat, communication error, analog input error, USB communication error, brake sequence error 4 to 7 ^②									
	Protection rating	IP 20									
Others	Cooling		Self-cooling			Fan cooling			Self-cooling		
	Power loss	W	40	55	90	100	180	240	300	400	500
	Weight	kg	1.9	1.9	2.0	2.0	1.9	1.9	2.0	2.1	2.1
	Dimensions (W × H × D)	mm	140 × 150 × 114			140 × 150 × 135			220 × 150 × 147		220 × 260 × 190
Order information		Order no.	211955	211956	211957	211958	211959	211960	211961	211962	211963

Remarks:

- ① The applied motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi 4-pole standard motor.
- ② The specifications of the rated output capacity are related to a motor voltage of 440 V.
- ③ The rated output current in the parentheses applies for an ambient temperature less than 40 °C.
- ④ The % value of the overload capacity indicated is the ratio of the overload current to the inverter's rated output current. For repeated duty, allow time for the inverter and motor to return to or below the temperatures under 100 % load.
- ⑤ The maximum output voltage does not exceed the power supply voltage. The maximum output voltage can be changed within the setting range. However, the pulse voltage value of the inverter output side voltage remains unchanged at about $\sqrt{2}$ that of the power supply.
- ⑥ The power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and cables).
- ⑦ This protective function does not function in the initial status.


Block Diagram FR-E700



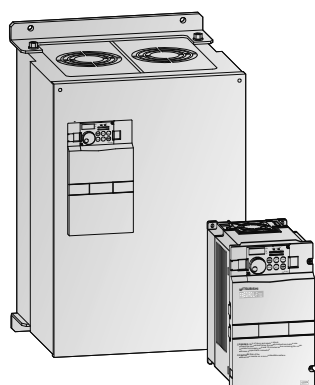
Assignment of Signal Terminals

Function	Terminal	Designation	Description
Control connection	STF	Forward rotation start	The motor rotates forward, if a signal is applied to terminal STF. When the STF and STR signals are turned on simultaneously, the stop command is given.
	STR	Reverse rotation start	The motor rotates reverse, if a signal is applied to terminal STR. When the STF and STR signals are turned on simultaneously, the stop command is given.
	RH, RM, RL	Multi-speed selection	Preset of 15 different output frequencies; programmable.
	MRS	Output stop	Turn on the MRS signal (20 ms or more) to stop the inverter output. Use to shut off the inverter output when stopping the motor by electromagnetic brake.
	RES	RESET input	Used to reset alarm output provided when protective function is activated. Turn on the RES signal for more than 0.1 s, then turn it off. Initial setting is for reset always. By setting Pr. 75, reset can be set to enabled only at an inverter alarm occurrence. Recover about 1 s after reset is cancelled.
Common	SD	Contact input common (sink) 24 V DC power supply common	A determined control function is activated, if the corresponding terminal is connected to the terminal SD (sink logic). The SD terminal is isolated from the digital circuits via optocouplers. The terminal is isolated from the reference potential of the analog circuit (terminal 5).
	PC	Contact input common (source) 24 V DC power supply	24 V DC/0.1 A output; reference potential for source logic
Setting value specification	10	Voltage output for potentiometer	Output voltage 5 V DC Max. output current 10 mA Recommended potentiometer: 1 k Ω , 2 W linear
	2	Input for frequency setting value signal	The voltage setting value 0–5 (10) V is applied to this terminal. The voltage range is preset to 0–5 V. The input resistance is 10 k $\Omega \pm 1$ k Ω .
	5	Reference point for frequency setting value signal	Terminal 5 is the reference point for all analog setting values and for the analog output signal AM. The terminal is not isolated from the reference potential of the control circuit and must not be earthed.
	4	Input for current setting value signal	The current setting value signal 4–20 mA DC (0–5(10) V) is applied to this terminal. The input resistance is 233 $\Omega + 5$ Ω .
Signal outputs	A, B, C	Relay output (alarm output)	The alarm is output via relay contacts; programmable. The maximum contact load is 230 V AC/0.3 A or 30 V DC/0.3 A.
	RUN	Signal output for motor operation	The output is switched low, if the inverter output frequency is equal to or higher than the starting frequency. The output is switched high, if no frequency is output or the DC brake is in operation (programmable).
	FU	Signal output for monitoring output frequency	The output is switched low once the output frequency exceeds a value preset in parameter 42 (or 43). Otherwise the FU output is switched high (programmable).
	SE	Reference potential for signal outputs	Reference potential for the signals RUN and FU. This terminal is isolated from the reference potential of the control circuit PC/SD.
	AM	Analog voltage output	One of 18 monitoring functions can be selected, e.g. external frequency output. The functions are determined by parameters. A DC voltmeter can be connected. The max. output voltage is 10 V.
Interface	—	PU connector (RS485)	Communications via RS485 I/O standard: RS485, Multi-Drop operation, max. 38,400 Baud
	—	USB connector	The FR Configurator can be operated by connecting the inverter to the personal computer through USB. Interface: conforms to USB 1.1; Transmission speed: 12 MBaud; Connector: USB mini B connector (receptacle mini B type)

Assignment of Main Circuit Terminals

Function	Terminal	Designation	Description
Main circuit connection	R/L1, S/L2, T/L3	Power supply	Connect to the commercial power supply. Keep these terminals open when using the high power factor converter (FR-HC) or power regeneration common converter (FR-CV).
	P/+, N/–	External brake unit connection	Connect the brake unit (FR-BU2), power regeneration common converter (FR-CV) or high power factor converter (FR-HC).
	P/+, PR	External brake resistor connection	Connect a brake transistor (FR-ABR) across terminals P/+ and PR.
	P/+, P1	DC reactor connection	Remove the jumper across terminals P/+ and P1 and connect a DC reactor.
	U, V, W	Motor connection	Voltage output of the inverter (3-phase, 0 V up to power supply voltage, 0.2–400 Hz)
	 PE	PE	Protective earth connection of inverter

The FR-F700 Series



The FR-F700 is distinguished by its high energy-conservation potential. Major energy savings are achieved especially in the important lower speed ranges and during the run-up and braking phases. At an initial frequency of 35 Hz, for instance, the energy savings come to 57 % when compared with conventional concepts. The OEC (Optimum Excitation Control) technology effects an additional 10 % energy saving. It provides the ideal flux to the motor at all times.

Output range:

0.75–630 kW, 380–480 V
(Type 01800 or above: 380–500 V AC)

Available accessories:

Optional control units, versatile options and useful accessories are available for this frequency inverter.

Please refer to page 35 for details.

Technical Details FR-F740-00023 to -01160

Product line				FR-F740															
				00023	00038	00052	00083	00126	00170	00250	00310	00380	00470	00620	00770	00930	01160		
Output	Rated motor capacity ^① [kW]	120 % overload capacity (SLD) ^⑤		0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55		
		150 % overload capacity (LD)		0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55		
	Rated current ^② [A]	120 % overload capacity (SLD) ^⑤	I rated ^⑥ I max. 60 s I max. 3 s	2.3	3.8	5.2	8.3	12.6	17	25	31	38	47	62	77	93	116		
				2.5	4.2	5.7	9.1	13.9	18.7	27.5	34.1	41.8	51.7	68.2	84.7	102.3	127.5		
				2.8	4.6	6.2	10	15.1	20.4	30	37.2	45.6	56.4	74.4	92.4	111.6	139.2		
		150 % overload capacity (LD)	I rated ^⑥ I max. 60 s I max. 3 s	2.1	3.5	4.8	7.6	11.5	16	23	29	35	43	57	70	85	106		
				2.5	4.2	5.8	9.1	13.8	19.2	27.6	34.8	42	51.6	68.4	84	102	127.2		
				3.1	5.2	7.2	11.4	17.2	24	34.5	43.5	52.5	64.5	85.5	105	127.5	159		
	Output capacity [kVA]	SLD ^⑤		1.8	2.9	4.0	6.3	9.6	13	19.1	23.6	29.0	35.8	47.3	58.7	70.9	88.4		
		LD		1.6	2.7	3.7	5.8	8.8	12.2	17.5	22.1	26.7	32.8	43.4	53.3	64.8	80.8		
	Overload capacity ^②	SLD		120 % of rated motor capacity for 3 s; 110 % for 1 min. (max. ambient temperature 40 °C) – typical for pumps and fans															
		LD		150 % of rated motor capacity for 3 s; 120 % for 1 min. (max. ambient temperature 50 °C) – typical for conveyor belts and centrifuges															
	Voltage ^③				3-phase AC, 0 V to power supply voltage														
	Frequency range				0.5–400 Hz														
	Control method				V/f control, optimum excitation control or simple magnetic flux vector control														
	Modulation control				Sine evaluated PWM, Soft PWM														
	Carrier frequency				0.7–14.5 kHz (user adjustable)														
Input	Power supply voltage			3-phase, 380–480 V AC, -15 %/+10 %															
	Voltage range			323–528 V AC at 50/60 Hz															
	Power supply frequency			50/60 Hz ±5 %															
	Rated input capacity ^④ [kVA]	SLD ^⑤		2.8	5.0	6.1	10	13	19	22	31	37	45	57	73	88	110		
LD		2.5	4.5	5.5	9	12	17	20	28	34	41	52	66	80	100				
Others	Cooling			Self cooling				Fan cooling											
	Protective structure			IP 20												IP 00			
	Power loss [kW]	SLD ^⑤		0.06	0.08	0.1	0.16	0.19	0.24	0.34	0.39	0.49	0.58	0.81	1.0	1.17	1.51		
		LD		0.05	0.08	0.09	0.14	0.18	0.22	0.31	0.35	0.44	0.52	0.71	0.93	1.03	1.32		
	Weight			kg	3.5	3.5	3.5	3.5	3.5	6.5	6.5	7.5	7.5	13	13	23	35	35	
	Dimensions (W×H×D)			mm	150×260×140					220×260×170			220×300×190			250×400×190		325×550×195	435×550×250
Order information ^⑦				Order no.	156569	156570	156571	156572	156573	156594	156595	156596	156597	156598	156599	156600	156601	156602	

Remarks:

Explanation for ① to ⑦ see next page.

Technical Details FR-F740-01800 to -12120

Product line				FR-F740														
				01800	02160	02600	03250	03610	04320	04810	05470	06100	06830	07700	08660	09620	10940	12120
Output	Rated motor capacity ^① [kW]	120 % overload capacity (SLD) ^⑤		90	110	132	160	185	220	250	280	315	355	400	450	500	560	630
		150 % overload capacity (LD)		75	90	110	132	160	185	220	250	280	315	355	400	450	500	560
	Rated current ^② [A]	120 % overload capacity (SLD) ^⑤	I rated ^⑥	180	216	260	325	361	432	481	547	610	683	770	866	962	1094	1212
			I max. 60 s	198	238	286	357	397	475	529	602	671	751	847	953	1058	1203	1333
			I max. 3 s	216	259	312	390	433	518	577	656	732	820	924	1039	1154	1313	1454
		150 % overload capacity (LD)	I rated ^⑥	144	180	216	260	325	361	432	481	547	610	683	770	866	962	1094
			I max. 60 s	173	216	259	312	390	433	518	577	656	732	820	924	1039	1154	1313
			I max. 3 s	216	270	324	390	487	541	648	721	820	915	1024	1155	1299	1443	1641
	Output capacity [kVA]	SLD ^⑤		137	165	198	248	275	329	367	417	465	521	587	660	733	834	924
		LD		110	137	165	198	248	275	329	367	417	465	521	587	660	733	834
	Overload capacity ^②	SLD		120 % of rated motor capacity for 3 s; 110 % for 1 min. (max. ambient temperature 40 °C) – typical for pumps and fans														
		LD		150 % of rated motor capacity for 3 s; 120 % for 1 min. (max. ambient temperature 50 °C) – typical for conveyor belts and centrifuges														
	Voltage ^③			3-phase AC, 0 V to power supply voltage														
	Frequency range			0.5–400 Hz														
	Control method			V/f control, optimum excitation control or simple magnetic flux vector control														
	Modulation control			Sine evaluated PWM, Soft PWM														
	Carrier frequency			0.7–6 kHz (user adjustable)														
Input	Power supply voltage		3-phase, 380–500 V AC, -15 %/+10 %															
	Voltage range		323–550 V AC at 50/60 Hz															
	Power supply frequency		50/60 Hz ± 5 %															
	Rated input capacity ^④ [kVA]	SLD ^⑤		137	165	198	248	275	329	367	417	465	520	587	660	733	834	924
LD		110	137	165	198	248	275	329	367	417	465	520	587	660	733	834		
Others	Cooling		Fan cooling															
	Protective structure		IP 00															
	Power loss [kW]	SLD ^⑤		2.7	3.3	3.96	4.8	5.55	6.6	7.5	8.4	9.45	10.65	12.0	13.5	15.0	16.8	18.9
		LD		2.25	2.7	3.3	3.96	4.8	5.55	6.6	7.5	8.4	9.45	10.65	12.0	13.5	15.0	16.8
	Frequency inverter weight	kg	37	50	57	72	72	110	110	220	220	220	260	260	370	370	370	
	Reactor weight	kg	20	22	26	28	29	30	35	38	42	46	50	57	67	85	95	
	Dimensions (W × H × D)	mm	435 × 550 × 250	465 × 620 × 300		465 × 740 × 360		498 × 1010 × 380		680 × 1010 × 380			790 × 1330 × 440		995 × 1580 × 440			
Order information ^⑦		Order no.	156603	156604	156605	156606	156607	156608	156609	156610	156611	156612	156613	156614	156615	156616	156617	

Remarks:

- ① The performance figures at the rated motor capacity are based on a motor voltage of 440 V AC.
- ② The overload capacity in % is the ratio of the overload current to the inverter's rated current in the respective operating mode. For repeated duty cycles allow sufficient time for the inverter and the motor to cool below the temperature reached at 100 % load. The waiting periods can be calculated using the r.m.s. current method ($I^2 \times t$), which requires knowledge of the duty.
- ③ The maximum output voltage cannot exceed the power supply voltage. The output voltage can be varied over the entire power supply voltage range.
- ④ The rated input capacity varies depending on the impedance values on the power supply side of the inverter (including the cables and input reactor).
- ⑤ When the load curve with 120 % overload capacity is selected the maximum permitted ambient temperature is 40 °C.
- ⑥ When operating with carrier frequencies ≥ 2.5 kHz this value is reduced automatically as soon as the frequency inverter exceeds 85 % of the rated output current.
- ⑦ The inverter types FR-F740-02160 and above are all delivered with PCBs with two coats of protective varnish. For types FR-F740-00023 through 01800 varnished PCBs are standard. The double-coated version is available as an option.

Technical Details FR-F746-00023 to -01160

Product line				FR-F746														
				00023	00038	00052	00083	00126	00170	00250	00310	00380	00470	00620	00770	00930	01160	
Output	Rated motor capacity ^① [kW]	120% overload capacity (SLD) ^⑤		0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	
		150% overload capacity (LD)		0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	
	Rated current [A]	120% overload capacity (SLD) ^⑤	I rated ^⑥	2.3	3.8	5.2	8.3	12.6	17	25	31	38	47	62	77	93	116	
			I max. 60 s	2.5	4.2	5.7	9.1	13.9	18.7	27.5	34.1	41.8	51.7	68.2	84.7	102.3	127.5	
			I max. 3 s	2.8	4.6	6.2	10	15.1	20.4	30	37.2	45.6	56.4	74.4	92.4	111.6	139.2	
		150% overload capacity (LD)	I rated ^⑥	2.1	3.5	4.8	7.6	11.5	16	23	29	35	43	57	70	85	106	
			I max. 60 s	2.5	4.2	5.8	9.1	13.8	19.2	27.6	34.8	42	51.6	68.4	84	102	127.2	
			I max. 3 s	3.1	5.2	7.2	11.4	17.2	24	34.5	43.5	52.5	64.5	85.5	105	127.5	159	
	Output capacity [kVA]	SLD ^⑤	1.8	2.9	4.0	6.3	9.6	13	19.1	23.6	29.0	35.8	47.3	58.7	70.9	88.4		
		LD	1.6	2.7	3.7	5.8	8.8	12.2	17.5	22.1	26.7	32.8	43.4	53.3	64.8	80.8		
	Overload capacity ^②	SLD	120% of rated motor capacity for 3 s; 110% for 1 min. (max. ambient temperature 30 °C) – typical for pumps and fans															
		LD	150% of rated motor capacity for 3 s; 120% for 1 min. (max. ambient temperature 40 °C) – typical for conveyor belts and centrifuges															
	Voltage ^③			3-phase AC, 0 V to power supply voltage														
	Frequency range			0.5–400 Hz														
	Control method			V/f control, optimum excitation control or simple magnetic flux vector control														
	Modulation control			Sine evaluated PWM, Soft PWM														
	Carrier frequency			0.7 kHz–14.5 kHz (user adjustable)														
Input	Power supply voltage		3-phase, 380–480 V AC, -15%/+10%															
	Voltage range		323–528 V AC at 50/60 Hz															
	Power supply frequency		50/60 Hz ± 5 %															
	Rated input capacity ^④ [kVA]	SLD ^⑤	2.8	5.0	6.1	10	13	19	22	31	37	45	57	73	88	110		
		LD	2.5	4.5	5.5	9	12	17	20	28	34	41	52	66	80	100		
Others	Cooling		Fan cooling															
	Protective structure		IP 54															
	Power loss [kW]	SLD ^⑤	0.06	0.08	0.1	0.16	0.19	0.24	0.34	0.39	0.49	0.58	0.81	1.0	1.17	1.51		
		LD	0.05	0.08	0.09	0.14	0.18	0.22	0.31	0.35	0.44	0.52	0.71	0.93	1.03	1.32		
	Weight		kg	12.5	12.5	12.5	12.5	12.5	18.5	18.5	21.5	21.5	30	30	30	42	42	
	Dimensions (W × H × D)		mm	249 × 395 × 210					319 × 395 × 240			319 × 445 × 260		354 × 560 × 260		360 × 590 × 265	471 × 660 × 320	
Order information			Order no.	163796	163797	163798	163799	163800	163801	163802	163803	163804	163805	163806	163807	163808	163809	

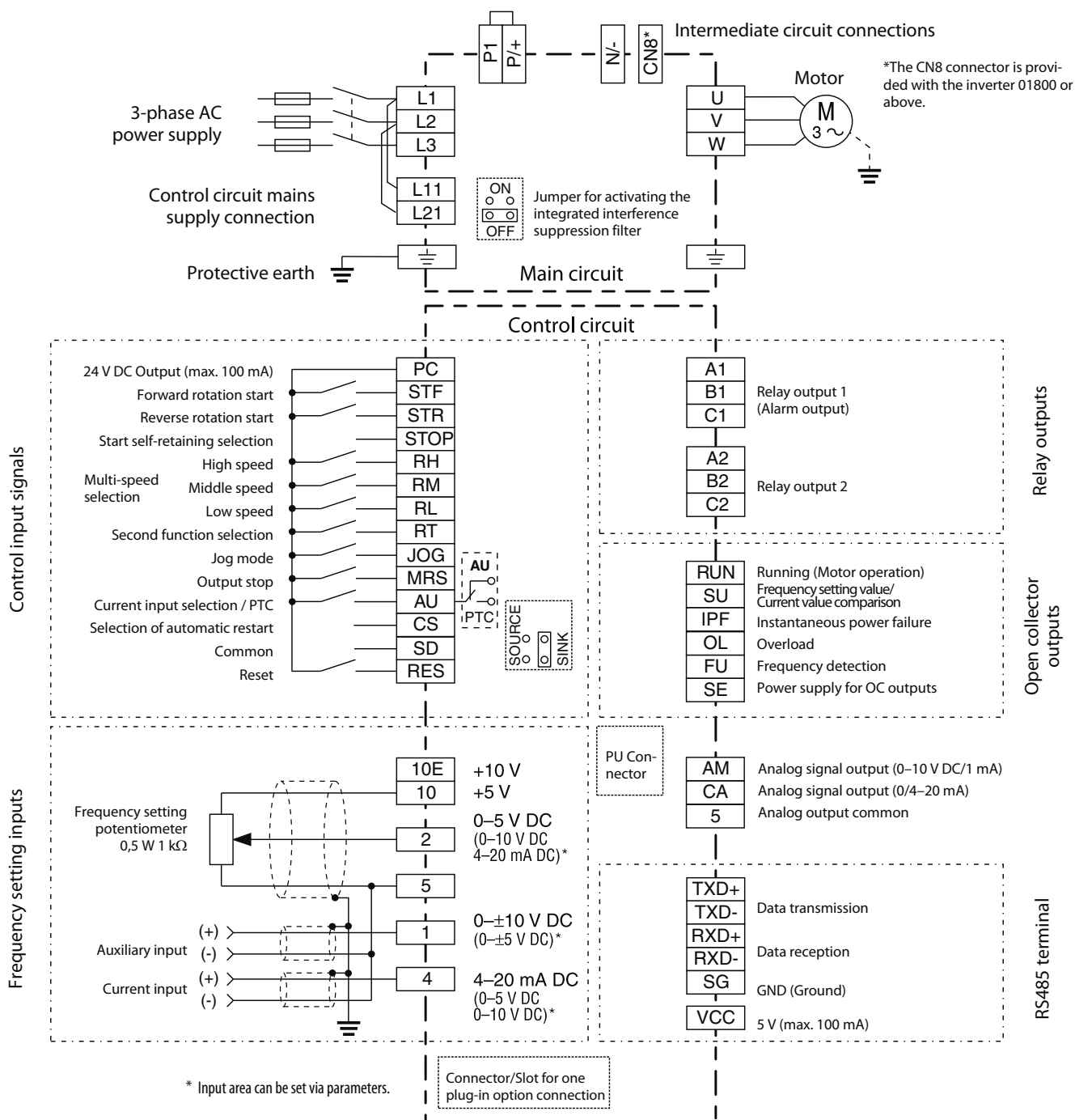
Remarks:

- ① The performance figures at the rated motor capacity are based on a motor voltage of 440 V.
- ② The overload capacity in % is the ratio of the overload capacity to the inverter's rated current in the respective operating mode. For repeated duty cycles allow sufficient time for the inverter and the motor to cool below the temperature reached at 100 % load. The waiting periods can be calculated using the r.m.s. current method ($I^2 \times t$), which requires knowledge of the duty.
- ③ The maximum output voltage cannot exceed the power supply voltage. The output voltage can be varied over the entire power supply voltage range.
- ④ The rated input capacity varies depending on the impedance values on the power supply side of the inverter (including the cables and input reactor).
- ⑤ When the load curve with 120 % overload capacity is selected the maximum permitted ambient temperature is 30 °C.
- ⑥ When operating with carrier frequencies ≥ 2.5 kHz this value is reduced automatically as soon as the frequency inverter exceeds 85 % of the rated output current.

Common Specifications FR-F700

FR-F740/FR-F746			Description
Control specifications	Frequency setting resolution	Analog input	0.015 Hz/0–50 Hz (terminal 2, 4: 0–10 V/12 bit) 0.03 Hz/0–50 Hz (terminal 2, 4: 0–5 V/11 bit, 0–20 mA / 11 bit, terminal 1: -10–+10 V/12 bit) 0.06 Hz/0–50 Hz (terminal 1: 0–±5 V/11 bit)
		Digital input	0.01 Hz
	Frequency accuracy		±0.2 % of the maximum output frequency (temperature range 25° ±10 °C) via analog input; ±0.01 % of the set output frequency (via digital input)
	Voltage/frequency characteristics		Base frequency adjustable from 0 to 400 Hz; selection between constant torque, variable torque or optional flexible 5-point V/f characteristics
	Starting torque		120 % (3 Hz) when set to simple magnetic flux vector control and slip compensation
	Acceleration/deceleration time		0; 0.1 to 3600 s (can be set individually)
	Acceleration/deceleration characteristics		Linear or S-form course, user selectable
	DC injection brake		Operating frequency (0–120 Hz), operating time (0–10 s) and operating voltage (0–30 %) can be set individually. The DC brake can also be activated via the digital input.
	Stall prevention		Response threshold 0–150 %, user adjustable, also via analog input
	Motor protection		Electronic motor protection relay (rated current user adjustable)
Control signals for operation	Frequency setting values	Analog input	Terminal 2, 4: 0–5 V DC, 0–10 V DC, 0/4–20 mA Terminal 1: 0–± 5 V DC, 0–± 10 V DC
		Digital input	Parameter unit or optional expansion board
	Start signal		Available individually for forward rotation and reverse rotation. Start signal automatic self-holding input (3-wire input) can be selected.
	Input signals		Any of 12 signals can be selected using parameters 178 to 189 (input terminal function selection): multi speed, second parameter function, terminal 4 input, JOG operation, automatic restart after instantaneous power failure, external thermal relay input, FR-HC connection (inverter operation enable signal) and FR-HC connection (instantaneous power failure detection), PU operation/external interlock signal, External DC injection brake operation start, PID control, PU operation, PU <-> external operation, output stop, start self-holding, traverse function selection, forward/reverse rotation command, inverter reset, PTC thermistor input, PID forward/reverse operation switchover, PU <-> NET, NET <-> external operation, command source switchover
	Output signals	Operating status	Any of 7 signals can be selected using parameter 190 to 196 (output terminal function selection): Frequency control status, instantaneous power failure (under voltage), overload warning, output frequency detection, second output frequency detection, regenerative brake with pre-alarm (01800 and above), electronic thermal relay function with pre-alarm, PU operation mode, inverter operation ready, output current detection, zero current detection, PID lower limit, PID upper limit, PID forward rotation/reverse rotation, commercial power supply-inverter switchover, direct mains operation motor 1-4, frequency inverter operation motor 1-4, inverter running start command ON, deceleration at an instantaneous power failure, PID control activated, restart, PID output suspension, life time alarm, alarm output 3 (OFF signal), power savings average value update timing, current average monitor, alarm output2, maintenance timer alarm, remote outputs, minor failure output, alarm output, traverse operation, open-collector outputs (5 outputs), relay outputs (2 outputs), alarm code outputs (4 bits via open-collector)
		When using the FR-A7AY, FR-A7AR option	In addition to the above operating modes parameters 313-319 (function selection for the additional 7 output terminals) can also be used to assign the following four signals: control circuit capacitor life, main circuit capacitor life, cooling fan life, inrush current limit circuit life (Only positive logic can be set for extension terminals of the FR-A7AR)
		Analog output	You can also use parameter 54 (assign analog current output) and 158 (assign analog voltage output) to assign the following displays to one or both outputs: output frequency, motor current (steady or peak value), output voltage, frequency setting value, motor running speed, converter output voltage (steady or peak), electronic thermal relay function load factor, input voltage, output voltage, load meter, reference voltage output, motor load factor, energy saving effect, regenerative brake circuit duty (01800 and above), PID set point, PID process value
Display	Parameter unit display (FR-PU07/FR-DU07)	Operating status	Output frequency, motor current (steady or peak value), output voltage, alarm indication, frequency setting, motor running speed, converter output voltage (steady or peak value), electronic thermal load factor, input power, output power, road meter, cumulative energization time, actual operation time, motor load factor, watt-hours meter, power saving effect, cumulative saving power, regenerative brake circuit duty (01800 and above), PID set point, PID process value, PID deviation monitor, I/O terminal monitor, optional input terminal monitor (FR-DU07 only), optional output terminal monitor (FR-DU07 only), option fitting state monitor (FR-PU07 only), terminal assignment state (FR-PU07 only)
		Alarm definition	Alarm definition is displayed when the protective function is activated, the output voltage/current/frequency/cumulative energization time right before the protection function was activated and the past 8 alarm definitions are stored.
		Interactive guidance	Operation guide/trouble shooting with a help function (FR-PU07 only)
Protection	Protective functions		Overcurrent cutoff (during acceleration, deceleration or at constant speed), overvoltage cutoff (during acceleration, deceleration or at constant speed), inverter protection thermal operation, motor protection thermal operation, heatsink overheat, instantaneous power failure occurrence, under voltage, input phase failure, motor overload, output short circuit, ground fault overcurrent, output phase failure, external thermal relay operation, PTC thermistor operation, option alarm, parameter error, PU disconnection, retry count excess, CPU alarm, power supply short for parameter unit, 24 V DC power output short, output current detection value over, inrush resistance overheat, communication error (frequency inverter), analog input alarm, internal circuit alarm (15 V DC power supply), fan fault, overcurrent stall prevention, overvoltage stall prevention, electronic thermal pre-alarm, PU stop, maintenance timer alarm (FR-DU07 only), MT-BU5 external brake module overload (01800 and above), parameter write error, copy error, parameter unit lock, parameter copy error

Block Diagram FR-F700



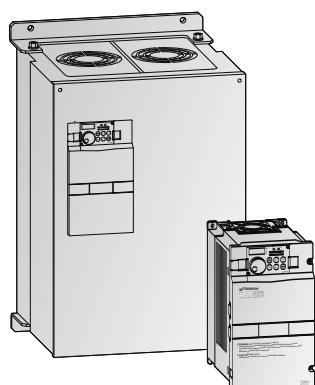
Assignment of Main Circuit Terminals

Function	Terminal	Designation	Description
Main circuit connection	L1, L2, L3	Mains supply connection	Mains power supply of the inverters (380–480 V AC, 50/60 Hz); (380–500 V for FR-F700–01800 and above)
	P/+, N/-	External brake unit connection	An optional external brake resistor can be connected to the terminals P and N or you can connect a optional high power factor converter.
	P1, P/+	DC reactor connection	An optional DC reactor can be connected to the terminals P1 and P/+. The jumper on terminals P1 and P/+ must be removed when this optional choke coil is used on frequency inverter models 01160 and below. The DC reactor supplied with the unit must be installed on frequency inverter models 01800 and above.
	U, V, W	Motor connection	Voltage output of the inverter (3-phase, 0 V up to power supply voltage, 0.5–400 Hz)
	L11, L21	Control circuit mains supply connection	To use external power for the control circuit connect the mains power to L11/L21 (and remove jumpers L1 and L2).
	CN8	External brake transistor control	Control connection for external brake module (type 01800 and above)
	PE	PE	Protective earth connection of inverter

Assignment of Signal Terminals

Function	Terminal	Designation	Description
Control connection (programmable)	STF	Forward rotation start	The motor rotates forward, if a signal is applied to terminal STF.
	STR	Reverse rotation start	The motor rotates reverse, if a signal is applied to terminal STR.
	STOP	Start self-retaining selection	The start signals are self-retaining, if a signal is applied to terminal STOP.
	RH, RM, RL	Multi-speed selection	Preset of 15 different output frequencies
	JOG	Jog mode selection	The JOG mode is selected, if a signal is applied to terminal JOG (factory setting). The start signals STF and STR determine the rotation direction.
	RT	Second parameter settings	A second set of parameter settings is selected, if a signal is applied to terminal RT.
	MRS	Output stop	The inverter lock stops the output frequency without regard to the delay time. You can select a make or break signal for the controller inhibit function by changing parameter 17.
	RES	RESET input	An activated protective circuit is reset, if a signal is applied to the terminal RES ($t > 0,1$ s).
	AU	Current input selection PTC input	The 0/4–20mA signal on terminal 4 is enabled by a signal on the AU terminal. If you connect a PTC temperature sensor you must assign the PTC signal to the AU terminal and set the slide switch on the control circuit board to the PTC position.
	CS	Automatic restart after instantaneous power failure	The inverter restarts automatically after a power failure, if a signal is applied to the terminal CS.
Common	SD	Reference potential (0 V) for the PC terminal (24 V)	When “sink” control logic is selected by setting the control signal jumper a specific control function is triggered when the corresponding control terminal is connected to the SD terminal. When “source” control logic is selected and you are using external 24 V power you must connect the 0 V of the external power supply to terminal SD. The SD terminal is isolated from the digital electronics with optocouplers.
	PC	24 V DC output	Internal power supply 24 V DC/0.1 A output
Setting value specification	10 E	Voltage output for potentiometer	Output voltage 10 V DC. Max. output current 10 mA. Recommended potentiometer: 1 k Ω , 2 W linear
	10		Output voltage 5 V DC. Max. output current 10 mA. Recommended potentiometer: 1 k Ω , 2 W linear
	2	Input for frequency setting value signal	The setting value 0–10 V or 0/4–20 mA is applied to this terminal. You can switch between voltage and current setpoint values with parameter 73. The input resistance is 10 k Ω .
	5	Frequency setting common and analog outputs	Terminal 5 provides the common reference potential (0 V) for all analog set point values and for the analog output signals CA (current) and AM (voltage). The terminal is isolated from the digital circuit's reference potential (SD). This terminal should not be grounded.
	1	Auxiliary input for frequency setting value signal 0– \pm 5 (10) V DC	An additional voltage setting value signal of 0– \pm 5 (10) V DC can be applied to terminal 1. The voltage range is preset to 0– \pm 10 V DC. The input resistance is 10 k Ω .
	4	Input for setting value signal	The setting value 0/4–20 mA or 0–10 V is applied to this terminal. You can switch between voltage and current setpoint values with parameter 267. The input resistance is 250 Ω . The current setting value is enabled via terminal function AU.
Signal output (programmable)	A1, B1, C1	Potential free Relay output 1 (Alarm)	The alarm is output via relay contacts. The block diagram shows the normal operation and voltage free status. If the protective function is activated, the relay picks up. The maximum contact load is 200 V AC/0.3 A or 30 V DC/0.3 A.
	A2, B2, C2	Potential free Relay output 2	Any of the available 42 output signals can be used as the output driver. The maximum contact load is 230 V AC/0.3 A or 30 V DC/0.3 A.
	RUN	Signal output for motor operation	The output is switched low, if the inverter output frequency is equal to or higher than the starting frequency. The output is switched high, if no frequency is output or the DC brake is in operation.
	SU	Signal output for frequency setting value/current value comparison	The SU output supports a monitoring of frequency setting value and frequency current value. The output is switched low, once the frequency current value (output frequency of the inverter) approaches the frequency setting value (determined by the setting value signal) within a preset range of tolerance.
	IPF	Signal output for instantaneous power failure	The output is switched low for a temporary power failure within a range of $15 \text{ ms} \leq t_{\text{IPF}} \leq 100 \text{ ms}$ or for under voltage.
	OL	Signal output for overload alarm	The OL is switched low, if the output current of the inverter exceeds the current limit preset in parameter 22 and the stall prevention is activated. If the output current of the inverter falls below the current limit preset in parameter 22, the signal at the OL output is switched high.
	FU	Signal output for monitoring output frequency	The output is switched low once the output frequency exceeds a value preset in parameter 42 (or 43). Otherwise the FU output is switched high.
	SE	Reference potential for signal outputs	The potential that is switched via open collector outputs RUN, SU, OL, IPF and FU is connected to this terminal.
	CA	Current output 0–20 mA	One of 18 monitoring functions can be selected, e.g. external frequency output. CA and AM output can be used simultaneously. The functions are determined by parameters. An amperemeter can be connected (measuring range: 0–20 mA).
	AM	Analog output 0–10 V (1 mA)	One of 18 monitoring functions can be selected, e.g. external frequency output. CA and AM output can be used simultaneously. The functions are determined by parameters. A DC voltmeter can be connected. The max. output voltage is 10 V.
Interface	—	PU connector (RS485)	Communications via RS485 I/O standard: RS485, Multi-Drop operation, 4,800–38,400 Baud (overall length: 500 m)
	—	RS485 terminal (via RS485 terminal)	Communications via RS485 I/O standard: RS485, Multi-Drop operation, 300–38,400 Baud (overall length: 500 m)

The FR-A700 Series



The FR-A700 series is pure high technology. This new generation of Mitsubishi Electric inverters combine innovative functions and reliable technology with maximum power, economy and flexibility. Among many other features it enables Online Autotuning for outstanding speed constancy, excellent smooth running performance for wear-free operation of a synchronous motors, controlled shut down after emergency stops and a large number of digital inputs and outputs.

Output range:

0.4–630 kW, 380–480 V
(Type 01800 or above: 380–500 V AC)

Available accessories:

Optional control units, versatile options and useful accessories are available for this frequency inverter.

Please refer to page 35 for details.

Technical Details FR-A740-00023 to -01160

Product line			FR-A740														
			00023	00038	00052	00083	00126	00170	00250	00310	00380	00470	00620	00770	00930	01160	
Output	Rated motor capacity ^① [kW]	120 % overload capacity (SLD)	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	
		150 % overload capacity (LD)	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	
		200 % overload capacity (ND)	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	
		250 % overload capacity (HD)	0.25	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	
	Rated current ^② [A]	120 % overload capacity (SLD)	I rated ^③	2.3	3.8	5.2	8.3	12.6	17	25	31	38	47	62	77	93	116
			I max. 60 s	2.5	4.2	5.7	9.1	13.9	18.7	27.5	34.1	41.8	51.7	68.2	84.7	102.3	127.6
			I max. 3 s	2.8	4.6	6.2	10.0	15.1	20.4	30.0	37.2	45.6	56.4	74.4	92.4	111.6	139.2
		150 % overload capacity (LD)	I rated ^③	2.1	3.5	4.8	7.6	11.5	16	23	29	35	43	57	70	85	106
			I max. 60 s	2.5	4.2	5.8	9.1	13.8	19.2	27.6	34.8	42.0	51.6	68.4	84.0	102.0	127.2
			I max. 3 s	3.2	5.3	7.2	11.4	17.3	24.0	34.5	43.5	52.5	64.5	85.5	105.0	127.5	159.0
		200 % overload capacity (ND)	I rated ^③	1.5	2.5	4	6	9	12	17	23	31	38	44	57	71	86
			I max. 60 s	2.3	3.8	6.0	9.0	13.5	18.0	25.5	34.5	46.5	57.0	66.0	85.5	106.5	129.0
			I max. 3 s	3.0	5.0	8.0	12.0	18.0	24.0	34.0	46.0	62.0	76.0	88.0	114.0	142.0	172.0
		250 % overload capacity (HD)	I rated ^③	0.8	1.5	2.5	4	6	9	12	17	23	31	38	44	57	71
			I max. 60 s	1.6	3.0	5.0	8.0	12.0	18.0	24.0	34.0	46.0	62.0	76.0	88.0	114.0	142.0
			I max. 3 s	2.0	3.8	6.3	10.0	15.0	22.5	30.0	42.5	57.5	77.5	95.0	110.0	142.5	177.5
	Output capacity ^② [kVA]	SLD	1.8	2.9	4.0	6.3	9.6	13.0	19.1	23.6	29.0	35.8	47.3	58.7	70.9	88.4	
		LD	1.6	2.7	3.7	5.8	8.8	12.2	17.5	22.1	26.7	32.8	43.4	53.3	64.8	80.8	
		ND	1.1	1.9	3.0	4.6	6.9	9.1	13.0	17.5	23.6	29.0	33.5	43.4	54.1	65.5	
		HD	0.6	1.1	1.9	3.0	4.6	6.9	9.1	13.0	17.5	23.6	29.0	33.5	43.4	54.1	
	Overload capacity ^④	SLD	110 % of rated motor capacity for 60 s; 120 % for 3 s (max. ambient temperature 40 °C) – inverse time characteristics														
		LD	120 % of rated motor capacity for 60 s; 150 % for 3 s (max. ambient temperature 50 °C) – inverse time characteristics														
		ND	150 % of rated motor capacity for 60 s; 200% for 3 s (max. ambient temperature 50 °C) – inverse time characteristics														
		HD	200 % of rated motor capacity for 60 s; 250 % for 3 s (max. ambient temperature 50 °C) – inverse time characteristics														
	Voltage ^⑤		3-phase AC, 0 V to power supply voltage														
	Frequency range		0.5–400 Hz														
	Modulation control		Sine evaluated PWM, Soft PWM														
	Regenerative braking torque		100 % torque/2 % ED								20 % torque/continuous ^⑥			20 % torque/continuous			

Remarks:

Explanation for ① to ⑥ see next page.

Product line		FR-A740														
		00023	00038	00052	00083	00126	00170	00250	00310	00380	00470	00620	00770	00930	01160	
Input	Power supply voltage	3-phase, 380–480 V AC, -15%/+10%														
	Voltage range	323–528 V AC at 50/60 Hz														
	Power supply frequency	50/60 Hz ±5%														
	SLD	2.5	4.5	5.5	9	12	17	20	28	34	41	52	66	80	100	
	Rated input capacity ^⑥	LD	2.1	4	4.8	8	11.5	16	20	27	32	37	47	60	73	91
	[kVA]	ND	1.5	2.5	4.5	5.5	9	12	17	20	28	34	41	52	66	80
	HD	0.8	1.5	2.5	4.5	5.5	9	12	17	20	28	34	41	52	66	
Others	Cooling	Self cooling			Fan cooling											
	Protective structure ^⑦	IP 20 ^⑦											IP 00			
	SLD	0.06	0.082	0.98	0.15	0.21	0.28	0.39	0.4	0.55	0.69	0.97	1.18	1.36	1.78	
	LD	0.05	0.08	0.09	0.14	0.18	0.22	0.31	0.35	0.44	0.52	0.71	0.93	1.03	1.32	
	ND	0.05	0.065	0.075	0.1	0.15	0.2	0.25	0.29	0.4	0.54	0.65	0.81	1.02	1.3	
	HD	0.043	0.05	0.06	0.075	0.1	0.146	0.18	0.21	0.29	0.4	0.54	0.65	0.74	1.02	
	Weight	kg	3.8	3.8	3.8	3.8	3.8	7.1	7.1	7.5	7.5	13	13	23	35	35
	Dimensions (W × H × D)	mm	150 × 260 × 140				220 × 260 × 170		220 × 300 × 190		250 × 400 × 190		325 × 550 × 195	435 × 550 × 250		
Order information		Order no.	169826	169797	169798	169799	169800	169801	169802	169803	169804	169805	169806	169807	169808	169809

Remarks:

- ① The applicable motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi Electric 4-pole standard motor. The 200 % overload capacity (ND) is the factory default setting.
- ② The rated output capacity indicated assumes that the output voltage is 440 V.
- ③ When operating the inverter of 75K (type 02160) or more with a value larger than 2 kHz set in Pr. 72 (PWM frequency selection), the rated output current is max. 85 %.
- ④ The % value of the overload capacity indicates the ratio of the overload current to the inverter's rated output current. For repeated duty, allow time for the inverter and motor to return to or below the temperatures under 100 % load. The waiting periods can be calculated using the r.m.s. current method ($I^2 \times t$), which requires knowledge of the duty.
- ⑤ The maximum output voltage does not exceed the power supply voltage. The maximum output voltage can be changed within the setting range. However, the pulse voltage value of the inverter output side voltage remains unchanged at about $\sqrt{2}$ that of the power supply.
- ⑥ The power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and cables).
- ⑦ FR-DU07: IP 40 (except for the PU connector)
- ⑧ When operating with carrier frequencies ≥ 2.5 kHz this value is reduced automatically as soon as the frequency inverter exceeds 85 % of the rated output current.

Technical Details FR-A740-01800 to -12120

Product line			FR-A740														
			01800	02160	02600	03250	03610	04320	04810	05470	06100	06830	07700	08660	09620	10940	12120
Output	Rated motor capacity ^① [kW]	120 % overload capacity (SLD)	90	110	132	160	185	220	250	280	315	355	400	450	500	550	630
		150 % overload capacity (LD)	75	90	110	132	160	185	220	250	280	315	355	400	450	500	560
		200 % overload capacity (ND)	55	75	90	110	132	160	185	220	250	280	315	355	400	450	500
		250 % overload capacity (HD)	45	55	75	90	110	132	160	185	220	250	280	315	355	400	450
	Rated current ^③ [A]	120 % overload capacity (SLD)	I rated ^③		180	216	260	325	361	432	481	547	610	683	770	866	962
			I max. 60 s		198	238	286	358	397	475	529	602	671	751	847	953	1058
			I max. 3 s		216	259	312	390	433	518	577	656	732	820	924	1039	1154
		150 % overload capacity (LD)	I rated ^③		144	180	216	260	325	361	432	481	547	610	683	770	866
			I max. 60 s		173	216	259	312	390	433	518	577	656	732	820	924	1039
			I max. 3 s		216	270	324	390	488	542	648	722	821	915	1025	1155	1299
		200 % overload capacity (ND)	I rated ^③		110	144	180	216	260	325	361	432	481	547	610	683	770
			I max. 60 s		165	216	270	324	390	488	542	648	722	821	915	1025	1155
			I max. 3 s		220	288	360	432	520	650	722	864	962	1094	1220	1366	1540
		250 % overload capacity (HD)	I rated ^③		86	110	144	180	216	260	325	361	432	481	547	610	683
			I max. 60 s		172	220	288	360	432	520	650	722	864	962	1094	1220	1366
			I max. 3 s		215	275	360	450	540	650	813	903	1080	1203	1368	1525	1708
	Output capacity ^② [kVA]	SLD	137	165	198	248	275	329	367	417	465	521	587	660	733	834	924
		LD	110	137	165	198	248	275	329	367	417	465	521	587	660	733	834
		ND	100	110	137	165	198	248	275	329	367	417	465	521	587	660	733
		HD	80	84	110	137	165	198	248	275	329	367	417	465	521	587	660
	Overload capacity ^④	SLD	110 % of rated motor capacity for 60 s; 120 % for 3 s (max. ambient temperature 40 °C) – inverse time characteristics														
		LD	120 % of rated motor capacity for 60 s; 150 % for 3 s (max. ambient temperature 50 °C) – inverse time characteristics														
		ND	150 % of rated motor capacity for 60 s; 200 % for 3 s (max. ambient temperature 50 °C) – inverse time characteristics														
		HD	200 % of rated motor capacity for 60 s; 250 % for 3 s (max. ambient temperature 50 °C) – inverse time characteristics														
	Voltage ^⑤		3-phase AC, 0 V to power supply voltage														
	Frequency range		0.2–400 Hz														
	Control method		V/F control, advanced magnetic flux vector control and real sensorless vector control)/vector control (when used with option FR-A7AP)														
	Modulation control		Sine evaluated PWM, Soft PWM														
	Regenerative braking torque (max. value/permissible duty)		20 % torque/cont.	10 % torque/continuous													

Remarks:

Explanation for ① to ⑤ see next page.

Product line			FR-A740														
			01800	02160	02600	03250	03610	04320	04810	05470	06100	06830	07700	08660	09620	10940	12120
Input	Power supply voltage		3-phase, 380–500 V AC, -15 %/+10 %														
	Voltage range		323–550 V AC at 50/60 Hz														
	Power supply frequency		50/60 Hz ±5 %														
	Rated input capacity [kVA]	SLD	137	165	198	247	275	329	366	416	464	520	586	660	733	833	924
		LD	110	137	165	198	247	275	329	366	416	464	520	586	659	733	833
ND		100	110	137	165	198	248	275	329	367	417	465	521	587	660	733	
HD		80	84	110	137	165	198	248	275	329	367	417	465	521	587	660	
Others	Cooling		Fan cooling														
	Protective structure ②		IP 00														
	Power loss [kW]	SLD	2.65	2.9	3.57	3.8	4.2	5.02	5.5	6.4	7.2	8.19	8.6	10.37	11.5	13.2	14.94
		LD	2.0	2.4	2.9	3.0	3.8	4.2	5.1	5.5	6.4	7.2	8.0	8.6	10.2	11.5	13.20
		ND	1.54	1.9	2.4	2.5	3.0	4.0	4.2	5.0	5.5	6.5	7.0	7.3	8.1	9.3	10.5
		HD	1.14	1.44	1.9	1.97	2.5	2.57	4.0	4.2	5.0	5.5	6.5	7.0	6.91	8.1	9.3
	Frequency inverter weight	kg	37	50	57	72	72	110	110	175	175	175	260	260	370	370	370
	Reactor weight	kg	20	22	26	28	29	30	35	38	42	46	50	57	67	85	95
	Dimensions (W × H × D)	mm	435 × 550 × 250	465 × 620 × 300		465 × 740 × 360		498 × 1010 × 380		680 × 1010 × 380			790 × 1330 × 440		995 × 1580 × 440		
Order information		Order no.	169810	169811	169812	169813	168814	169815	169816	169817	169818	169819	169820	169821	169822	169823	169824

Remarks:

- ① The applicable motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi Electric 4-pole standard motor. The 200 % overload capacity (ND) is the factory default setting.
- ② The rated output capacity indicated assumes that the output voltage is 440 V AC.
- ③ When operating the inverter of 75K (type 02160) or more with a value larger than 2 kHz set in Pr. 72 (PWM frequency selection), the rated output current is max. 85 %.
- ④ The % value of the overload capacity indicates the ratio of the overload current to the inverter's rated output current. For repeated duty, allow time for the inverter and motor to return to or below the temperatures under 100 % load. The waiting periods can be calculated using the r.m.s. current method ($I^2 \times t$), which requires knowledge of the duty.
- ⑤ The maximum output voltage does not exceed the power supply voltage. The maximum output voltage can be changed within the setting range. However, the pulse voltage value of the inverter output side voltage remains unchanged at about $\sqrt{2}$ that of the power supply.
- ⑥ The power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and cables).
- ⑦ FR-DU07: IP 40 (except for the PU connector)
- ⑧ When operating with carrier frequencies ≥ 2.5 kHz this value is reduced automatically as soon as the frequency inverter exceeds 85 % of the rated output current.

FR-A740			Description
Control specifications	Frequency setting resolution	Analog input	0.015 Hz/0–50 Hz (terminal 2, 4: 0–10 V/12 bit) 0.03 Hz/0–50 Hz (terminal 2, 4: 0–5 V/11 bit, 0–20 mA/11 bit, terminal 1: –10–+10 V/12 bit) 0.06 Hz/0–50 Hz (terminal 1: 0–±5 V/11 bit)
		Digital input	0.01 Hz
	Frequency accuracy		±0.2 % of the maximum output frequency (temperature range 25° ± 10 °C) via analog input; ±0.01 % of the set output frequency (via digital input)
	Voltage/frequency characteristics		Base frequency adjustable from 0 to 400 Hz; selection between constant torque, variable torque or optional flexible 5-point V/f characteristics
	Starting torque		200 % 0.3 Hz (0.4 kVA to 3.7 kVA), 150 % 0.3 Hz (5.5 kVA or more) (under real sensorless vector control or vector control)
	Torque boost		Manual torque boost
	Acceleration/deceleration time		0; 0.1 to 3600 s (can be set individually)
	Acceleration/deceleration characteristics		Linear or S-form course, user selectable
	DC injection brake		Operating frequency (0–120 Hz), operating time (0–10 s) and operating voltage (0–30 %) can be set individually. The DC brake can also be activated via the digital input.
	Stall prevention operation level		Operation current level can be set (0–220 % adjustable), whether to use the function or not can be selected
	Motor protection		Electronic motor protection relay (rated current user adjustable)
	Torque limit level		Torque limit value can be set (0 to 400 % variable)
Control signals for operation	Frequency setting values	Analog input	Terminal 2, 4: 0–5 V DC, 0–10 V DC, 0/4–20 mA Terminal 1: 0–±5 V DC, 0–±10 V DC
		Digital input	Input using the setting dial of the parameter unit Four-digit BCD or 16 bit binary (when used with option FR-A7AX)
	Start signal		Available individually for forward rotation and reverse rotation. Start signal automatic self-holding input (3-wire input) can be selected.
	Input signals	Common	Any of 12 signals can be selected using parameters 178 to 189 (input terminal function selection): from among multi speed selection, remote setting, stop-on-contact, second function selection, third function selection, terminal 4 input selection, JOG operation selection, selection of automatic restart after instantaneous power failure, flying start, external thermal relay input, inverter operation enable signal (FR-HC/FR-CV connection), FR-HC connection (instantaneous power failure detection), PU operation/external inter lock signal , external DC injection brake operation start, PID control enable terminal, brake opening completion signal, PU operation/external operation switchover, load pattern selection forward rotation reverse rotation boost, V/F switching, load torque high-speed frequency, S-pattern acceleration/deceleration C switchover, pre-excitation, output stop, start self-holding selection, control mode changing, torque limit selection, start-time tuning start external input, torque bias selection 1, 2 ①, P/PI control switchover, traverse function selection, forward rotation command, reverse rotation command, inverter reset, PTC thermistor input, PID forward reverse operation switchover, PU-NET operation switchover, NET-external operation switchover, and command source switchover, conditional position pulse train sign ①, conditional position droop pulse clear
		Pulse train input	100 kpps
	Output signals	Operating status	Any of 7 signals can be selected using parameter 190 to 196 (output terminal function selection): from among inverter running, up-to-frequency, instantaneous power failure/undervoltage, overload warning, output frequency (speed) detection, second output frequency (speed) detection, third output frequency (speed) detection, regenerative brake prealarm, electronic thermal relay function pre-alarm, PU operation mode, inverter operation ready, output current detection, zero current detection, PID lower limit, PID upper limit, PID forward rotation reverse rotation output, commercial power supply-inverter switchover MC1, commercial power supply-inverter switchover MC2, commercial power supply-inverter switchover MC3, orientation completion ①, brake opening request, fan fault output, heatsink overheat pre-alarm , inverter running/start command on, deceleration at an instantaneous power failure, PID control activated, during retry, PID output interruption, life alarm, alarm output 1, 2, 3 (power-off signal), power savings average value update timing, current average monitor, maintenance timer alarm, remote output, forward rotation output ①, reverse rotation output*1, low speed output, torque detection, regenerative status output ①, start-time tuning completion, in-position completion ①, minor failure output and alarm output. Open collector output (5 points), relay output (2 points) and alarm code of the inverter can be output (4 bit) from the open collector
		When using the FR-A7AY, FR-A7AR option	In addition to the above operating modes parameters 313 to 319 (function selection for the additional 7 output terminals) can also be used to assign the following four signals: control circuit capacitor life, main circuit capacitor life, cooling fan life, inrush current limit circuit life (Only positive logic can be set for extension terminals of the FR-A7AR)
Analog output		You can select any signals using Pr. 54 FM terminal function selection (pulse train output) and Pr. 158 AM terminal function selection (analog output) from among output frequency, motor current (steady or peak value), output voltage, frequency setting, operation speed, motor torque, converter output voltage (steady or peak value), electronic thermal relay function load factor, input power, output power, load meter, motor excitation current, reference voltage output, motor load factor, power saving effect, regenerative brake duty ,PID set point, PID measured value, motor output, torque command, torque current command, and torque monitor.	
Display	Parameter unit display (FR-PU07/FR-DU07)	Operating status	Output frequency, motor current (steady or peak value), output voltage, frequency setting, running speed,motor torque, overload, converter output voltage (steady or peak value), electronic thermal relay function load factor, input power, output power, load meter, motor excitation current, cumulative energization time, actual operation time, motor load factor, cumulative power, energy saving effect, cumulative saving power, regenerative brake duty, PID set point, PID measured value, PID deviation, inverter I/O terminal monitor, input terminal option monitor ②, output terminal option monitor ②, option fitting status ③, terminal assignment status ③, torque command, torque current command, feed back pulse ①, motor output
		Alarm definition	Alarm definition is displayed when the protective function is activated, the output voltage/current/frequency/cumulative energization time right before the protection function was activated and the past 8 alarm definitions are stored.
		Interactive guidance	Operation guide/trouble shooting with a help function ⑤

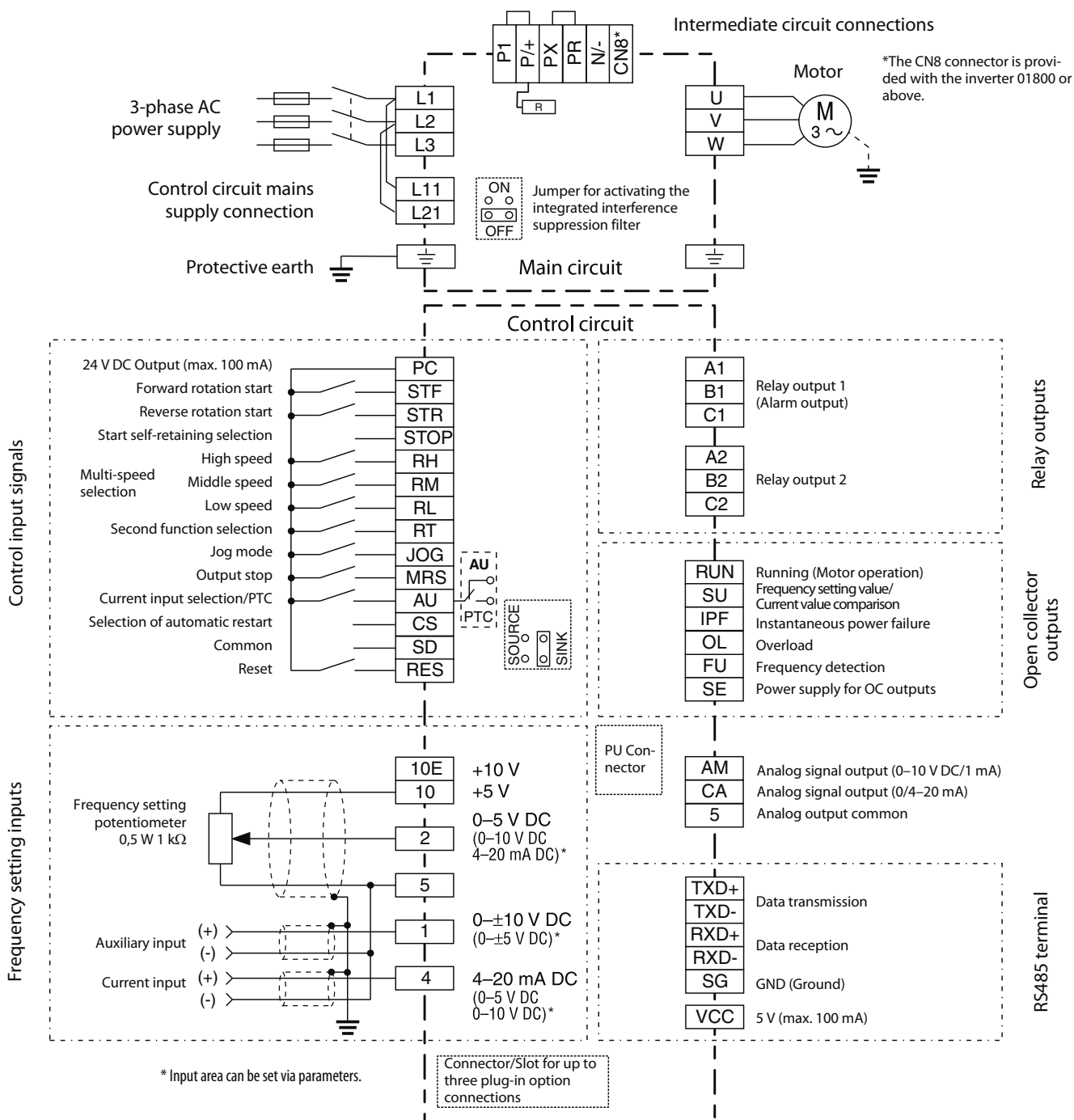
Explanation for ① to ③ see next page.

FR-A740		Description
Protection	Protective functions	Overcurrent during acceleration, overcurrent during constant speed, overcurrent during deceleration, overvoltage during acceleration, overvoltage during constant speed, overvoltage during deceleration, inverter protection thermal operation, motor protection thermal operation, heatsink overheat, instantaneous power failure occurrence, undervoltage, input phase failure, motor overload, output side earth (ground) fault overcurrent, output short circuit, main circuit element overheat, output phase failure, external thermal relay operation, PTC thermistor operation, option alarm, parameter error, PU disconnection, retry count excess, CPU alarm, parameter unit power supply short circuit, 24 V DC power output short circuit, output current detection value excess, inrush current limit circuit alarm, communication alarm (inverter), USB error, opposite rotation deceleration error, analog input error, fan fault, overcurrent stall prevention, overvoltage stall prevention, regenerative brake prealarm, electronic thermal relay function prealarm, PU stop, maintenance timer alarm ^② , brake transistor alarm, parameter write error, copy operation error, parameter unit lock, parameter copy alarm, speed limit indication, encoder no-signal ^① , speed deviation large ^① , overspeed ^① , position error large ^① , encoder phase error ^①

Remarks:

- ① Only when the option (FR-A7AP) is mounted
- ② Can be displayed only on the operation panel (FR-DU07).

Block Diagram FR-A700



Assignment of Main Circuit Terminals

Function	Terminal	Designation	Description
Main circuit connection	L1, L2, L3	Mains supply connection	Mains power supply of the inverters (380–480 V AC, 50/60 Hz); (380–500 V for type 01800 and above)
	P/+, PR	Brake resistor connection	An optional brake resistor (FR-ABR) can be connected across these terminals. The PR terminal is provided only for type 00023–00620.
	P/+, N/-	Brake unit connection	Connect the brake unit (FR-BU, BU), power regeneration common converter (FR-CV), high power factor converter (FR-HC and MT-HC) or power regeneration converter (MTRC).
	P/+, P1	DC reactor connection	An optional DC reactor can be connected to the terminals P1 and P/+. The jumper on terminals P1 and P/+ must be removed when this optional choke coil is used on frequency inverter models 01160 and below. The DC reactor supplied with the unit must be installed on frequency inverter models 01800 and above.
	PR, PX	Built-in brake circuit connection	When the jumper is connected across terminals PR and PX (initial status), the built-in brake reactor circuit is valid. The PX terminal is provided only for type 00023–00250.
	U, V, W	Motor connection	Voltage output of the inverter (3-phase, 0 V up to power supply voltage, 0.2–400 Hz)
	L11, L21	Power supply for control circuit	To use external power for the control circuit connect the mains power to L11/L21 (and remove jumpers L1 and L2).
	CN8	Ext. brake transistor control	Control connection for external brake module (type 01800 and above).
	PE	Protective earth connection of inverter	

Assignment of Signal Terminals

Function	Terminal	Designation	Description
Control connection (programmable)	STF	Forward rotation start	The motor rotates forward, if a signal is applied to terminal STF.
	STR	Reverse rotation start	The motor rotates reverse, if a signal is applied to terminal STR.
	STOP	Start self-retaining selection	The start signals are self-retaining, if a signal is applied to terminal STOP.
	RH, RM, RL	Multi-speed selection	Preset of 15 different output frequencies according to the combination of the RH, RM and RL signals.
	JOG	Jog mode selection	The JOG mode is selected, if a signal is applied to this terminal (factory setting).
		Pulse train input	The JOG terminal can be used as pulse train input terminal (parameter 291 setting needs to be changed)
	RT	Second parameter settings	A second set of parameter settings is selected, if a signal is applied to terminal RT.
	MRS	Output stop	The inverter lock stops the output frequency without regard to the delay time.
	RES	RESET input	An activated protective circuit is reset, if a signal is applied to the terminal RES ($t > 0,1$ s).
	AU	Current input selection	The 0/4–20 mA signal on terminal 4 is enabled by a signal on the AU terminal.
		PTC input	If you connect a PTC temperature sensor you must assign the PTC signal to the AU terminal and set the slide switch on the control circuit board to the PTC position.
	CS	Automatic restart after instantaneous power failure	The inverter restarts automatically after a power failure, if a signal is applied to the terminal CS.
Common	SD	Reference potential (0 V) for the PC terminal (24 V)	When “sink” control logic is selected by setting the control signal jumper a specific control function is triggered when the corresponding control terminal is connected to the SD terminal. When “source” control logic is selected and you are using external 24 V power you must connect the 0 V of the external power supply to terminal SD. The SD terminal is isolated from the terminals 5 and SE with optocouplers.
	PC	24 V DC output	Internal power supply 24 V DC/0.1 A output
Setting value specification	10 E	Voltage output for potentiometer	Output voltage 10 V DC. Max. output current 10 mA. Recommended potentiometer: 1 k Ω , 2 W linear
	10		Output voltage 5 V DC. Max. output current 10 mA. Recommended potentiometer: 1 k Ω , 2 W linear
	2	Input for frequency setting value signal	The setting value 0–5 V DC (or 0–10 V, 0/4–20 mA) is applied to this terminal. You can switch between voltage and current setpoint values with parameter 73. The input resistance is 10 k Ω .
	5	Frequency setting common and analog outputs	Terminal 5 provides the common reference potential (0 V) for all analog set point values and for the analog output signals CA (current) and AM (voltage). The terminal is isolated from the digital circuit's reference potential (SD). This terminal should not be grounded.
	1	Auxiliary input for frequency setting value signal 0– \pm 5 (10) V DC	An additional voltage setting value signal of 0– \pm 5 (10) V DC can be applied to terminal 1. The voltage range is preset to 0– \pm 10 V DC. The input resistance is 10 k Ω .
	4	Input for setting value signal	The setting value 0/4–20 mA or 0–10 V is applied to this terminal. You can switch between voltage and current setpoint values with parameter 267. The input resistance is 250 Ω . The current setting value is enabled via terminal function AU.
Signal output (programmable)	A1, B1, C1	Potential free relay output 1 (Alarm)	The alarm is output via relay contacts. The block diagram shows the normal operation and voltage free status. If the protective function is activated, the relay picks up. The maximum contact load is 200 V AC/0.3 A or 30 V DC/0.3 A.
	A2, B2, C2	Potential free relay output 2	Any of the available 42 output signals can be used as the output driver. The maximum contact load is 230 V AC/0.3 A or 30 V DC/0.3 A.
	RUN	Signal output for motor operation	The output is switched low, if the inverter output frequency is equal to or higher than the starting frequency. The output is switched high, if no frequency is output or the DC brake is in operation.
	SU	Signal output for frequency setting value/current value comparison	The SU output supports a monitoring of frequency setting value and frequency current value. The output is switched low, once the frequency current value (output frequency of the inverter) approaches the frequency setting value (determined by the setting value signal) within a preset range of tolerance.
	IPF	Signal output for instantaneous power failure	The output is switched low for a temporary power failure within a range of $15 \text{ ms} \leq t_{\text{IPF}} \leq 100 \text{ ms}$ or for under voltage.
	OL	Signal output for overload alarm	The OL is switched low, if the output current of the inverter exceeds the current limit preset in parameter 22 and the stall prevention is activated. If the output current of the inverter falls below the current limit preset in parameter 22, the signal at the OL output is switched high.
	FU	Signal output for monitoring output frequency	The output is switched low once the output frequency exceeds a value preset in parameter 42 (or 43). Otherwise the FU output is switched high.
	SE	Reference potential for signal outputs	The potential that is switched via open collector outputs RUN, SU, OL, IPF and FU is connected to this terminal.
	CA	Analog current output	One of 18 monitoring functions can be selected, e.g. external frequency output. CA- and AM output can be used simultaneously. The functions are determined by parameters. Output item: output frequency (initial setting), Load impedance: 200 Ω –450 Ω , Output signal: 0–20 mA
	AM	Analog signal output 0–10 V DC (1 mA)	Output item: output frequency (initial setting), output signal 0–10 V DC, permissible load current 1 mA (load impedance $\geq 10 \text{ k}\Omega$), Resolution 8 bit
Interface	—	PU connector	A parameter unit can be connected. Communications via RS485 I/O standard: RS485, Multi-Drop operation, 4,800 – 38,400 Baud (overall length: 500 m)
	—	RS485 terminal (via RS485 terminal)	Communications via RS485 I/O standard: RS485, Multi-Drop operation, 300 – 38,400 Baud (overall length: 500 m)
	—	USB connector	This USB interface is used to connect the inverter to a personal computer (conforms to USB1.1)

Parameter Overview

For simple variable-speed operation of the inverter, the initial setting of the parameters may be used as they are.

Set the necessary parameters to meet the load and operational specifications.

Parameter setting, change and check can be made from the parameter unit or by the Software FR-Configurator (see page 46 for more details).

The following list is an overview on the capabilities and functions of each inverter.

For details of parameters, refer to the appropriate instruction manual see www.mitsubishi-automation.de.

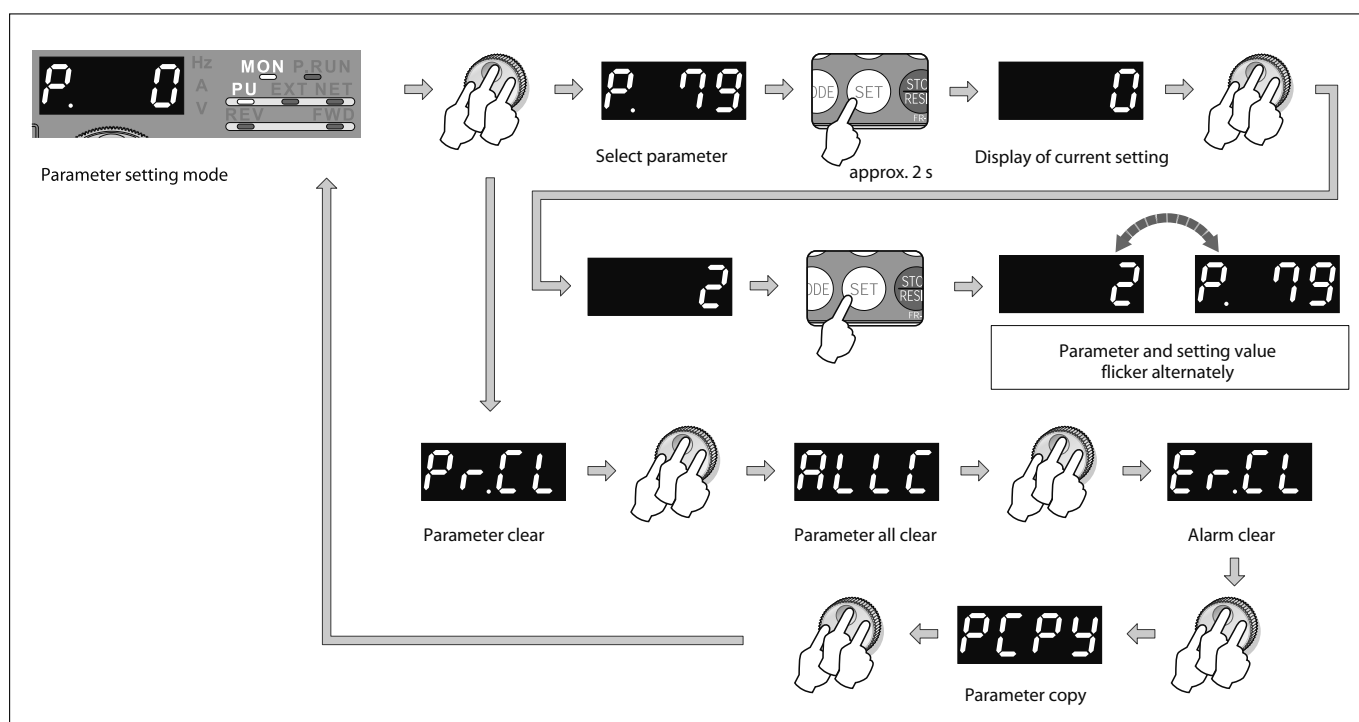
Function	FR-D700	FR-E700	FR-F700	FR-A700
Basic parameters	●	●	●	●
Parameters for standard drive operation	●	●	●	●
Settings of control outputs	●	●	●	●
2nd parameter settings	●	●	●	●
3rd parameter settings	—	—	—	●
Display functions	●	●	●	●
Restart	●	●	●	●
Operation settings	●	●	●	●
Vector control	●	●	●	●
Adjustable 5 points V/F	—	—	●	●
Orientation control	—	—	—	●
Encoder feedback	—	—	—	●
Pulse train input	—	—	—	●
Conditional position feed function	—	—	—	●
Torque command	—	—	—	●
Torque limit	—	—	—	●
Torque bias	—	—	—	●
Speed limit	—	—	—	●
Easy gain tuning	—	—	—	●
Adjustment function	—	—	—	●
Control system functions	—	—	—	●
Communication functions	●	●	●	●
PLC function	—	—	—	●
PID control	●	●	●	●
Commercial power supply switch-over	—	—	●	●
Backlash	—	—	●	●
Display	●	●	●	●
Variable current limiting	●	●	●	●
Output current detection	●	●	●	●
Auxiliary function	●	●	●	●
Cumulative monitor clear	●	●	●	●
User functions	—	●	●	●
Terminal functions selection	●	●	●	●
Multi-speed setting	●	●	●	●
Help functions	●	●	●	●
Slip compensation	●	●	●	●
Life check	●	●	●	●

Function	FR-D700	FR-E700	FR-F700	FR-A700
Special functions	—	—	●	●
Power failure stop	●	●	●	●
Load torque high speed frequency control	—	—	—	●
Stop-on contact control	—	●	—	●
Brake sequence function	—	●	—	●
Droop control	—	●	—	●
Password lock	●	—	—	—
Other functions	—	—	●	●
Remote outputs	●	●	●	●
Maintenance functions	●	●	●	●
Current average monitor	●	●	●	●
Speed smoothing control	●	●	—	—
PID Sleep function	●	—	●	—
Advanced PID control	—	—	●	—
Traverse function	●	—	●	●
Regeneration avoidance function	●	●	●	●
Free parameter	●	●	●	●
Energy saving monitor	—	—	●	●
Calibration function	●	●	●	●
Analog current output calibration function	—	—	●	●

Remark:

For an overview of all parameters, refer to the inverter's beginner's manual.

Setting parameters (example)



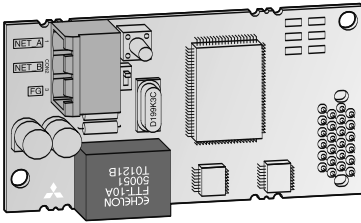
General Operating Conditions for all Inverters

Specifications	FR-D700	FR-E700	FR-F700	FR-A700
Ambient temperature in operation	-10 °C to +50 °C (non-freezing)	-10 °C to +50 °C (non-freezing)	FR-F740: -10 °C to +50 °C; FR-F746: -10 °C to +40 °C (non-freezing) ①	-10 °C to +50 °C (non-freezing)
Storage temperature ②	-20 to +65 °C	-20 to +65 °C	-20 to +65 °C	-20 to +65 °C
Ambient humidity	Max. 90 % (non-condensing)	Max. 90 % (non-condensing)	Max. 90 % (non-condensing)	Max. 90 % (non-condensing)
Altitude	Max. 1000 m above sea level. ③	Max. 1000 m above sea level. ③	Max. 1000 m above sea level.	Max. 1000 m above sea level.
Protective structure	Enclosed type IP 20	Enclosed type IP 20	FR-F740: IP 00/IP 20 ④ FR-F746: IP 54	IP 00/IP 20
Shock resistance	10 g (3 times each in 3 directions)	10 g (3 times each in 3 directions)	10 g (3 times each in 3 directions)	10 g (3 times each in 3 directions)
Vibration resistance	0.6 g: resistance to vibrations from 10–55 Hz for 2 hours along all 3 axes	0.6 g: resistance to vibrations from 10–55 Hz for 2 hours along all 3 axes	Max. 0.6 g (0.29 g or less for the 04320 or more.)	Max. 0.6 g (0.29 g or less for the 04320 or more.)
Ambient conditions	For indoor use only, avoid environments containing corrosive gases, install in a dust-free location.	For indoor use only, avoid environments containing corrosive gases, install in a dust-free location.	For indoor use only (F740), avoid environments containing corrosive gases, install in a dust-free location.	For indoor use only (A740), avoid environments containing corrosive gases, install in a dust-free location.
Approvals	UL/CSA/CE/EN/GOST/CCC	UL/CSA/CE/EN/GOST/CCC	FR-F740: CE/UL/cUL/DNV/GOST; FR-F746: CE/GOST/CCC	CE/UL/cUL/DNV/GOST/CCC

Remarks:

- ① For selection of the load characteristics with a 120 % overload rating the max. temperature is 40 °C (F740) and 30 °C (F746).
- ② The product may only be exposed to the full extremes of this temperature range for short periods (e.g. during transportation).
- ③ After that derate by 3 % for every extra 500 m up to 2500 m.
- ④ When the cable bushing for the optional expansion cards is broken out the unit has an IP 00 protection rating.

Internal and External Options



A large number of options allows an individual adoption of the inverter to the according task. The options can be installed quickly and easily. Detailed information on installation and functions is included in the manual of the options.

The options can be divided into two major categories:

- Internal options
- External options

Internal options

The internal options comprise input and output extensions as well as communications options supporting the operation of the inverter within a network or connected to a personal computer or PLC.

External Options

In addition to the FR-PU07 parameter unit that enables interactive operation of the frequency inverter the available external options also include additional EMC noise filters, reactors for improving efficiency and brake units with brake resistors.

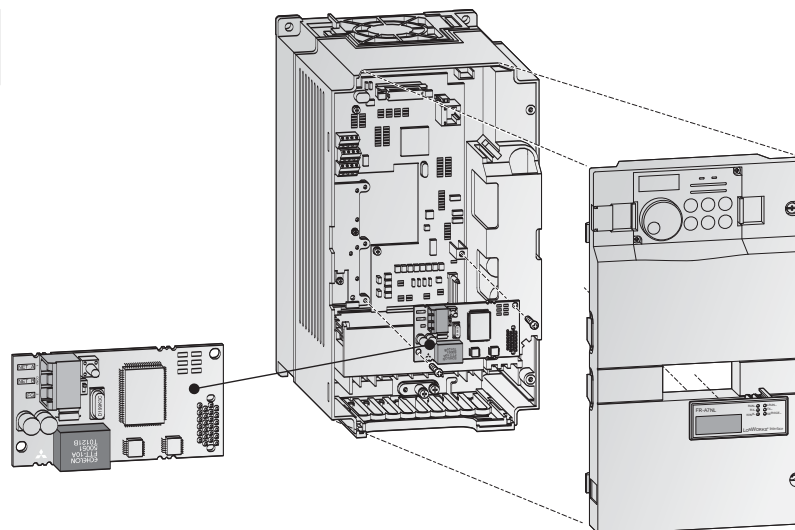
Option		Description	FR-D700	FR-E700	FR-F700	FR-A700
Internal options	Digital input	Input of the frequency setting via BCD or binary code	—	●	●	●
	Digital output	Selectable standard output signals of the inverter can be output at the open collector.	—	●	●	●
	Expansion analog output	Selectable additional signals can be output and indicated at the analog output.	—	●	●	●
	Relay output	Selectable standard output signals of the inverter can be output through relay terminals.	—	●	●	●
	Orientation control, encoder feedback (PLG), vector and master slave control	These options are used for position control, precise speed control and master/slave control.	—	—	—	●
	Communications	SSCNET	—	—	—	●
		Profibus/DP	—	●	●	●
		DeviceNet™	—	●	●	●
		CC-Link	—	●	●	●
		LonWorks	—	●	●	—
		CANopen	—	●	—	●
		Ethernet	—	●	●	●

Option		Description	FR-D700	FR-E700	FR-F700	FR-A700
External options	Parameter unit (8 languages)	Interactive parameter unit with LC display.	●	●	●	●
	FR-Configurator software	Parameterization and setup software for the Mitsubishi Electric inverter series.	●	●	●	●
	EMC noise filter	Noise filter for compliance with EMC directives.	●	●	●	●
	Brake unit	For an improvement of the brake capacity. For high inertia loads and active loads. Used in combination with a resistor unit.	●	●	●	●
	External high-duty brake resistor	To improve the brake capacity; used in combination with the internal brake transistor.	●	●	—	●
	DC reactor AC chokes	For increased efficiency, reduction of mains feedback and compensation of voltage fluctuations.	●	●	●	●
	Floor standing unit FSU	IP 20 physical contact protection in a freely-locatable floor-standing unit. Detailed information on request.	—	—	●	●

Overview Internal Options

Internal options	Description	Remarks/Specifications	Type	Applicable inverter	Art. no.
16-bit digital input	Interface for the input of the frequency setting via 4-digit BCD or 16-bit binary code, setting of gain and bias supported.	Input: 24 V DC; 5 mA; open collector or switching signal, sink or source logic	FR-A7AX	FR-F700 FR-A700	156775
			FR-A7AX E kit	FR-E700	210668
Digital output with Expansion analog output	Selectable of 43 standard output signals of the inverter can be output at the open collector. The outputs are isolated with optocouplers.	Output: max. 0–10 V DC; 0–20 mA; Resolution: 3 mV at voltage output, 10 mA at current output, accuracy: ±10 %	FR-A7AY	FR-F700 FR-A700	156776
	Selectable 2 of 18 additional signals (e.g. output frequency, output voltage, output current) can be output and indicated at the analog output. Display on measuring gauge: 20 mA DC or 5 V (10 V) DC		FR-A7AY E kit	FR-E700	210669
Relay output	Selectable 3 of 43 standard output signals of the inverter can be output through relay terminals.	Switching load: 230 V AC/0.3 A, 30 V DC/0.3 A	FR-A7AR	FR-F700 FR-A700	156777
			FR-A7AR E kit	FR-E700	210670
Encoder power supply	Control terminal block with integrated power supply	12 V DC	FR-A7PS	FR-A700	191399
I/O port	RS485 port, I/O card with twin terminal block	Data rate 4,800–38,400 bps	FR-E7TR	FR-E700	214299
Vector control with encoder feedback	Closed loop vector control with encoder can be performed. Encoder feedback enables high-precision speed, torque and position control.	5 V TTL differential 1024–4096 pulse	FR-A7AP	FR-A700	166133
Master-Slave control	Closed loop vector control with encoder can be performed. Master-Slave position and speed synchronisation are possible with command pulse scaling and position control.	11–30 V HTL complimentary	FR-A7AL	FR-A700	191402
Communications	CC-Link	Option board for the integration of a frequency inverter into a CC-Link network. The operation, display functions, and parameter settings can be controlled by a PLC.	FR-A7NC	FR-F700 FR-A700	156778
			FR-A7NC E kit	FR-E700	210671
	CAN Open	Option board for integration of a frequency inverter in a CAN Open network. Operation, display functions and parameter settings can be controlled by a computer (PC etc.) or a PLC.	FR-A7NCA	FR-A700	191424
			FR-A7NC E kit	FR-E700	210671
	Ethernet	Option board for integration of a frequency inverter in an Ethernet network. Operation, display functions and parameter settings can be controlled by a computer (PC etc.) or a PLC.	FR-A7NE	FR-A700	on request
	Ethernet multi-protocol	Ethernet multi-protocol interface card, Modbus TCP, Ethernet/IP, Profinet, BACnet with Modbus RTU	FR-A7N-ETH	FR-A740 FR-F740	212369
	LonWorks	Option board for integration of a frequency inverter in a LonWorks network. Operation, display functions and parameter settings can be controlled by a computer (PC etc.) or a PLC.	FR-A7NL	FR-F700 FR-A700	156779
			FR-A7NL E kit	FR-E700	210672
	Profibus/DP	Option board for the integration of a frequency inverter into a Profibus/DP network. The operation, display functions, and parameter settings can be controlled by a computer (PC etc.) or a PLC.	FR-A7NP	FR-F700 FR-A700	158524
			FR-A7NP E kit	FR-E700	210673
	DeviceNet™	Option board for the integration of a frequency inverter into a DeviceNet. The operation, display functions, and parameter settings can be controlled by a computer (PC etc.) or a PLC.	FR-D-Sub9	FR-F700 FR-A700	191751
			FR-A7ND	FR-F700 FR-A700	158525
	SSCNET III	Option board for the integration of a frequency inverter into the Mitsubishi Electric servo system network SSCNET III. The operation and display functions can be controlled by Motion Controller (Q172H CPU, Q173H CPU).	FR-A7ND E kit	FR-E700	210704
			FR-A7NS	FR-A700	191403

Mounting example of an internal option

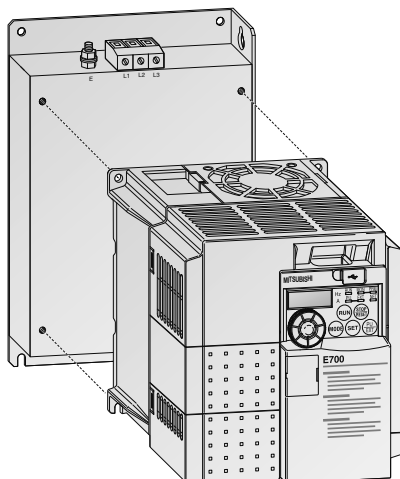


Overview External Options

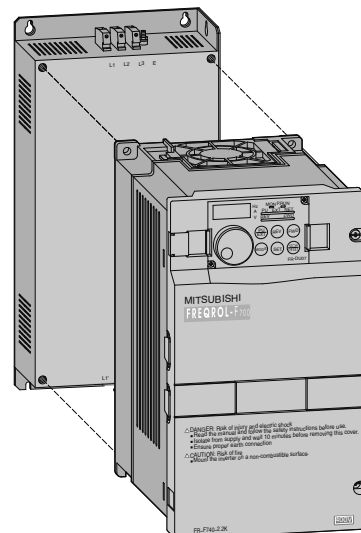
External options	Description	Remarks/Specifications	Type	Applicable inverter	Art. no.
Parameter unit	Interactive parameter unit with LC display (8 languages).	Refer to page 43 for details.	FR-PU07	All	166134
	Interactive standard parameter unit		FR-DU07	FR-A700 FR-F700	157514
	For mounting on the switchgear cabinet		FR-PA07	FR-D700 FR-E700	214795
Installation kit for external air cooling	For installation of the heatsink on the switchgear cabinet door	Reduces temperature in switchgear cabinet	FR-A7CN	FR-A700 FR-F700	refer to page 42
Connection cable for remote parameter unit	Cable for a remote connection of the parameter unit FR-PU07.	Available length: 1; 2.5 and 5 m	FR-A5 CBL	All	1 m: 70727 2.5 m: 70728 5 m: 70729
Distributor module for RJ45 connections	Distributor for connection of multiple inverters in a serial network	4 connections	FR-RJ45-HUB4	FR-A700	167612
		8 connections	FR-RJ45-HUB10		167613
	Terminating resistor for RJ45	120 Ω	FR-RJ45-TR	All	167614
Adapter	Connection adapter for FR-DU07	Required for remote connection of the FR-DU07 with FR-A5CBL	FR-ADP	FR-A700 FR-F700	157515
Interface cable	Communications cable for RS232 or RS485 interface to connect an external personal computer	Length 3 m	SC-FR PC	All	88426
USB-RS232 converter	Port converter adapter cable from RS-232 to USB	USB specification 1.1, 0.35 m long	USB-RS232	FR-D700 FR-F700	155606
FR-Configurator	Parameterization and setup software for Mitsubishi Electric inverter.	Refer to page 46 for details.	—	All	215701
EMC noise filter	Noise filter for compliance with EMC directives.	Refer to page 38 for details.	FFR-□□, FR-, FN-□□	All	refer to page 38
du/dt filter	Output filter for du/dt reduction	Refer to page 40 for details.	FFR-DT-□□A-SS1	All	refer to page 40
Sinusoidal filter	Output filter for sine wave output voltage	Refer to page 41 for details.	FFR-SI-□□A-SS1	All	refer to page 41
AC chokes	For increased efficiency, reduction of mains feedback and compensation of voltage fluctuations.	Refer to page 42 for details.	FR-BAL-B	All	refer to page 42
DC reactor ①	DC reactor for compensation of voltage fluctuations.	Refer to page 43 for details.	FR-HEL ①	All	refer to page 43
Brake units	For an improvement of the brake capacity. For high inertia loads and active loads. Used in combination with a resistor unit.	Refer to page 44 for details.	FR-BU2, BU-UFS + RUFC	All	refer to page 44
External high-duty brake resistor	To improve the brake capacity of the inverter; used in combination with the internal brake transistor	Refer to page 45 for details.	FR-ABR(H)	FR-D700 FR-E700 FR-A700	refer to page 45

① A DC reactor is included as standard equipment with frequency inverters FR-F740-01800 through 12120 and FR-A740-01800 through 12120. These reactors are essential for operation and must be installed.

Installing an EMC noise filter
on an FR-E700



Installing an EMC noise filter
on an FR-F700



EMV

Requirements

For complying with the EMC directives of the European Community regarding the electromagnetic compatibility, the inverter has to be equipped with a noise filter across the input circuit. Additionally it has to be installed and wired according to the EMC directives. The filters are designed to reduce conducted noise voltages to comply with the limits defined for Environments 1 and 2.

To ensure a proper and safe operation of the components follow the points below:

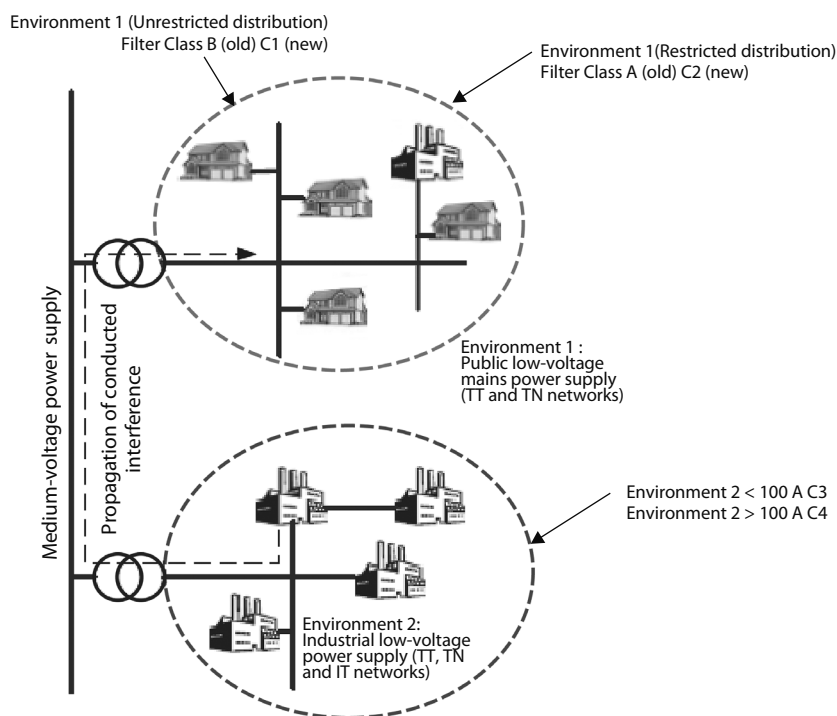
- Ground the filter prior to applying the power supply.
- For the selection of a ground fault protective switch or relay take the leakage current of the filter into account.
- Ensure a perfect grounding of the filter, if you do not intend to use a protective switch or relay across the input circuit.

Integrated noise filters

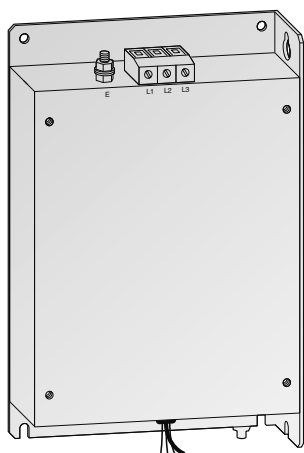
The frequency inverters of the FR-F740/FR-A740 series are fitted with an integrated EMC noise filter for industrial environments (Environment 2). They meet the emission requirements of EN 61800-3, Category C3/C4 with 5 m motor power supply cables (shielded) at a carrier frequency of 2 kHz. The filters listed here are thus only necessary for these inverters in special cases.

Environment

- First environment: Residential areas
The first environment is for drives that are connected to a low voltage mains power supply that also serves residential areas. Drives rated for this environment must conform to all EMC requirements that apply for all other devices used in residential, office and industrial environments.
- Second environment: Industrial areas
Drives rated for the second environment are only for use in industrial settings. Important: These drives may not be connected to a power supply that is also used by residential areas.



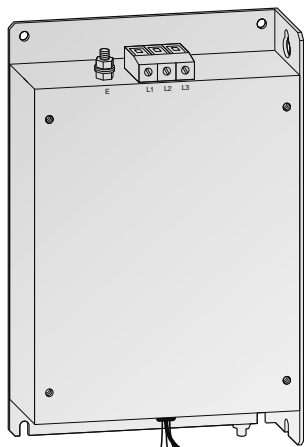
Noise Filters for FR-D700



Filter	Frequency inverter	Power loss [W]	Rated current [A]	Leakage current [mA]	Weight [kg]	Art. no.
FFR-CS-050-14A-RF1	FR-D720S-008-042	9	14	< 30	0.4	216227
FFR-CS-080-20A-RF1	FR-D720S-070	13	20	< 30	0.6	216228
FFR-CS-110-26A-RF1	FR-D720S-100	18	26	< 30	0.8	216229
FFR-CSH-036-8A-RF1	FR-D740-012-036	6	8	< 30	0.9	215007
FFR-CSH-080-16A-RF1	FR-D740-050/080	14	16	< 30	1.9	215008
FFR-MSH-170-30A-RF1	FR-D740-120/160	42	30	< 30	2.0	215005

The filters can provide conformity with following limits: C1 up to 25 m, C2 up to 100 m

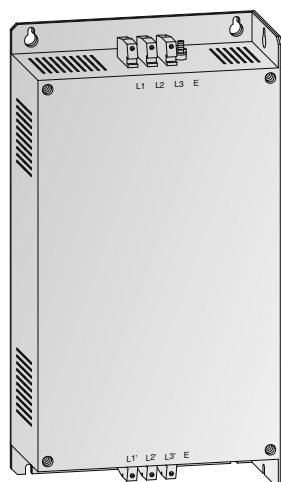
■ Noise Filters for FR-E700



Filter	Frequency inverter	Power loss [W]	Rated current [A]	Leakage current [mA]	Weight [kg]	Art. no.
FFR-MSH-040-8A-RF1	FR-E740-016-040	17	8	< 30	1.1	214953
FFR-MSH-095-16A-RF1	FR-E740-060/095	26	16	< 30	1.2	215004
FFR-MSH-170-30A-RF1	FR-E740-120/170	42	30	< 30	2.0	215005
FFR-MSH-300-50A-RF1	FR-E740-230/300	26	50	< 30	2.8	215006

The filters can provide conformity with following limits: C1 up to 25 m, C2 up to 100 m

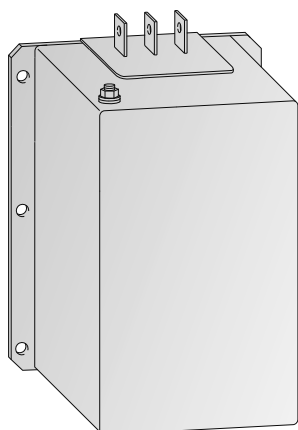
■ Noise Filters for FR-A/F740-00023 to -01800



Filter	Frequency inverter	Power loss [W]	Rated current [A]	Leakage current [mA]	Weight [kg]	Art. no.
FFR-BS-00126-18A-SF100	FR-A/F740-00023-00126	11.5	18	< 30	1.25	193677
FFR-BS-00250-30A-SF100	FR-A/F740-00170-00250	15.8	30	< 30	1.8	193678
FFR-BS-00380-55A-SF100	FR-A/F740-00310-00380	27.1	55	< 30	2.42	193679
FFR-BS-00620-75A-SF100	FR-A/F740-00470-00620	43.9	75	< 30	4.25	193680
FFR-BS-00770-95A-SF100	FR-A/F740-00770	45.8	95	< 30	6.7	193681
FFR-BS-00930-120A-SF100	FR-A/F740-00930	44.9	120	< 30	10.0	193682
FFR-BS-01800-180A-SF100	FR-A/F740-01160-01800	60.7	180	< 30	12.0	193683

The filters can provide conformity with following limits: C1 up to 20 m, C2 up to 100 m, C3 up to 100 m

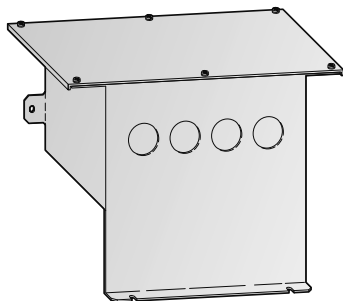
■ Noise Filters for FR-A/F740-02160 to -12120



Filter	Frequency inverter	Power loss [W]	Rated current [A]	Leakage current [mA]	Weight [kg]	Art. no.
FN 3359-250-28	FR-A/F740-02160-02600	38	250	< 6	7	104663
FN 3359-400-99	FR-A/F740-03250-04320	51	400	< 6	10.5	104664
FN 3359-600-99	FR-A/F740-04810-06100	65	600	< 6	11	104665
FN 3359-1000-99	FR-A/F740-06830-09620	84	1000	< 6	18	104666
FN 3359-1600-99	FR-A/F740-10940-12120	130	1600	< 6	27	130229

The filters can provide conformity with following limits: C2 up to 100 m, C4 up to 100 m

■ Noise Filters for FR-F746-00023 to -01160



Noise Filters conforming to EN 61800-3

The noise filters listed below make it possible to comply with the requirements for Environment 1 (unrestricted distribution) with shielded motor cables up to 20 m long and the requirements of Environment 1 (restricted distribution) with shielded motor cables up to 100 m long. This also provides compliance with the 100 A limits for Environment 2 with shielded cables up to 100 m long.

They meet the emission requirements of EN 61800-3, Category C1 and EN 55011.

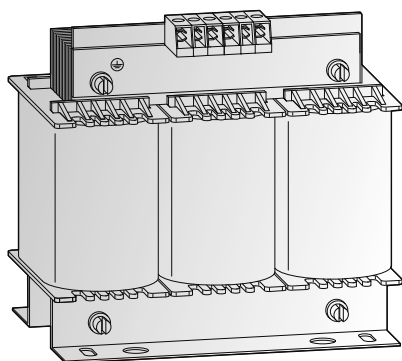
The frequency inverters of the FR-F746 series are fitted with an integrated EMC noise filter for industrial environments (Environment 2). They meet the emission requirements of EN 61800-3, Category C3 with 5 m motor power supply cables (shielded) at a clock frequency of 2 kHz.

Filter	Frequency inverter	Power loss ^① [W]	Rated current [A]	Leakage current [mA]	Weight [kg]	Art. no.
FFR-AF-IP54-21A-SM2	FR-F746-00023-00126	9.26	21	< 30	3.2	201551
FFR-AF-IP54-44A-SM2	FR-F746-00170-00250	20.3	44	< 30	4.4	201552
FFR-AF-IP54-62A-SM2	FR-F746-00310-00380	23	62	< 30	5.4	201553
FFR-AF-IP54-98A-SM2	FR-F746-00470-00620	51.8	98	< 30	7.7	201554
FFR-AF-IP54-117A-SM2	FR-F746-00770	61.6	117	< 30	10.6	201555
FFR-AF-IP54-172A-SM2	FR-F746-00930-01160	128.7	172	< 30	16	201556

^① Power dissipation at 20 °C and rated current with copper cables

The filters can provide conformity with following limits: C1 up to 20 m, C2 up to 100 m, C3 up to 100 m

■ du/dt Filters for FR-D700/E700/F700 and FR-A700



du/dt Filter

The du/dt output filter efficiently reduces the voltage rise time, motor heat

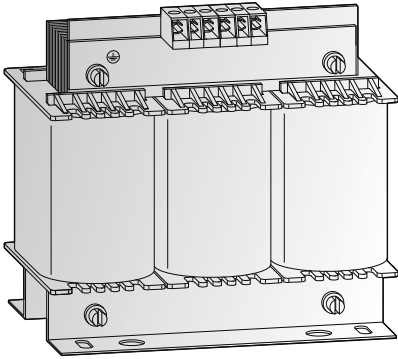
generation, insulation stressing and motor noise generation.

du/dt Filter	Frequency inverter	Power loss [W]	Rated current [A]	Weight [kg]	Dimensions (W×H×D)	Art. no.
FFR-DT-10A-SS1	FR-D740-012-080 FR-E740-016-060 FR-A/F740-00023-00083 ^①	25	10	1,2	125×65×120	209755
FFR-DT-25A-SS1	FR-D740-120/160 FR-E740-095-170 FR-A/F740-00126-00250 ^①	45	25	2,5	125×80×140	209756
FFR-DT-47A-SS1	FR-E740-230/300 FR-A/F740-00310-00470 ^①	60	47	6,1	155×110×195	209757
FFR-DT-93A-SS1	FR-A/F740-00620-00930 ^①	75	93	7,4	190×100×240	209758
FFR-DT-124A-SS1	FR-A740-01160/01800 ^① FR-F740-01160	110	124	8,2	190×150×170	209759
FFR-DT-182A-SS1	FR-A740-02160 ^① FR-F740-01800	140	182	16	210×160×185	209760
FFR-DT-330A-SS1	FR-A740-02600-03610 ^① FR-F740-02160-03250	240	330	32	240×240×220	209761
FFR-DT-500A-SS1	FR-A740-04320-05470 ^① FR-F740-03610-04810	340	500	35	240×220×325	209762
FFR-DT-610A-SS1	FR-A740-06100 ^① FR-F740-05470/06100	380	610	37	240×230×325	209763
FFR-DT-683A-SS1	FR-A740-06830/07700 ^① FR-F740-06830	410	683	38	240×230×325	209764
FFR-DT-790A-SS1	FR-A740-08660 ^① FR-F740-07700	590	790	43	300×218×355	209765
FFR-DT-1100A-SS1	FR-A740-09620-12120 ^① FR-F740-08660-10940	760	1100	66	360×250×380	209766
FFR-DT-1500A-SS1	FR-F740-12120	^②	1500	97 ^②	360×265×485	209767
FFR-DT-1920A-SS1	^②	1000	1920	105 ^②	360×260×595	209768

^① For FR-A700: Suitable for 200 % overload (ND). If the overload is lower (higher rated current) please use a filter one size higher.

^② Under review, may be subject to change

■ Sinusoidal Filter for FR-D700/E700/F700 and FR-A700



Sinusoidal Filter

The sinusoidal output filter ensures a sinusoidal output voltage with low voltage ripple. This makes it possible to use motors with lower insulation resistance and it also increases the maximum possible motor

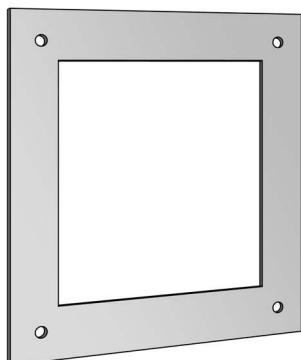
power cable length. It also reduces leakage current, motor heat and noise generation.

Sinusoidal Filter	Frequency inverter	Power loss [W]	Rated current [A]	Weight [kg]	Dimensions (W×H×D) [mm]	Art. no.
FFR-SI-4.5A-SS1	FR-D740-012/022 FR-E740-016-040 FR-F740-00023-00038 FR-A740-00023-00052 ①	66	4,5	3	125×75×180	209735
FFR-SI-8,3A-SS1	FR-D740-036/050 FR-E740-060 FR-F740-00023-00038 FR-A740-00023-00052 ①	73	8,3	6,6	155×95×205	209736
FFR-SI-18A-SS1	FR-D740-080/120 FR-E740-120 FR-A/F740-00126-00170 ①	144	18	11,5	190×120×230	209737
FFR-SI-25A-SS1	FR-D740-012-080 FR-E740-016-060 FR-F740-00023-00038 FR-A740-00023-00052 ①	191	25	14	210×125×260	209738
FFR-SI-32A-SS1	FR-D740-160 FR-E740-170 FR-A/F740-00250 ①	273	32	16	210×135×260	209739
FFR-SI-48A-SS1	FR-E740-230 FR-A/F740-00310 ①	340	48	28	240×210×290	209740
FFR-SI-62A-SS1	FR-A/F740-00620 ①	290	62	35	240×220×290	209741
FFR-SI-77A-SS1	FR-A/F740-00770 ①	340	77	42	300×210×345	209742
FFR-SI-93A-SS1	FR-A/F740-00930 ①	360	93	46	300×215×345	209743
FFR-SI-116A-SS1	FR-A/F740-01160 ①	400	116	58	300×237×345	209744
FFR-SI-180A-SS1	FR-AF740-01800/02160 ① FR-F740-01800	700	180	85	420×235×470	209745
FFR-SI-260A-SS1	FR-A740-02600/03250 ① FR-F740-02160/02600	900	260	123	420×260×470	209746
FFR-SI-432A-SS1	FR-A740-03610-04810 ① FR-F740-03250/03610	1400	432	190	480×310×580	209747
FFR-SI-481A-SS1	FR-A740-05470 ① FR-F740-04320/04810	1400	481	233	600×500×550	209748
FFR-SI-683A-SS1	FR-A740-06100/06830 ① FR-F740-05470-06830	2300	683	307	620×560×761	209749
FFR-SI-770A-SS1	FR-A/F740-07700 ①	3100	770	467	660×600×684	209750
FFR-SI-880A-SS1	FR-A740-08660/09620 ① FR-F740-08660	3600	880	638	760×620×893	209751
FFR-SI-1212A-SS1	FR-A740-10940/12120 ① FR-F740-09620-12120	3800	1212	678	740×590×936	209752
FFR-SI-1500A-SS1	②	②	1500	②	860×420×920	209753
FFR-SI-1700A-SS1	②	②	1700	②	860×420×920	209754

① For FR-A700: Suitable for 200% overload (ND). If the overload is lower (higher rated current) please use a filter one size higher.

② Under review, may be subject to change

External Heatsink Frame for FR-F700/A700

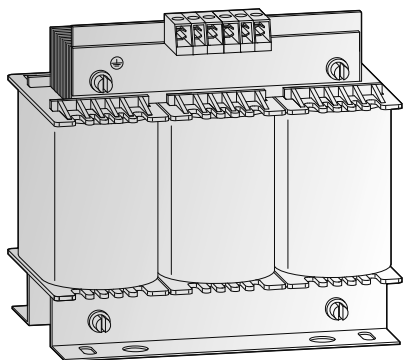


External Heatsink Frame

Frame for installing the inverter heatsink outside the switchgear cabinet (IP 20).

Frame	Frequency inverter	Art. no.
FR-A7CN01	FR-A/F740-00023-00126	189841
FR-A7CN02	FR-A/F740-00170/00250	189842
FR-A7CN03	FR-A/F740-00310/00380	189843
FR-A7CN04	FR-A/F740-00470/00620	189844
FR-A7CN06	FR-A/F740-00770	189846
FR-A7CN07	FR-A/F740-00930/01160/01800	189847
FR-A7CN08	FR-A/F740-02160	189848
FR-A7CN09	FR-A/F740-02600	189849
FR-A7CN10	FR-A/F740-03250/03610	189850

AC Chokes for FR-D700/E700/F700 and FR-A700



Three-phase mains supply chokes

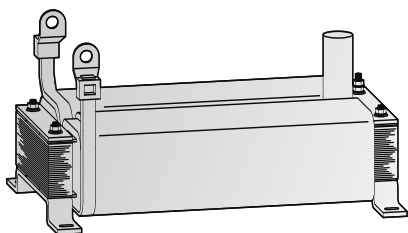
The three-phase mains supply chokes FR-BAL-B-□□k compensate voltage fluctuations and simultaneously increase the efficiency.

Applying the appropriate power choke an overall efficiency of up to 90 % can be achieved.

The use of a power choke is especially recommended for main circuits where high capacities are switched, for example via thyristors.

Choke	Frequency inverter	L [mH]	Current [A]	Power loss [W]	Weight [kg]	Art. no.
FR-BAL-B-4.0 k	FR-D740-012-080 FR-E740-016-095 FR-F740-00023-00083 FR-A740-00023-00126	2.340	12	31	3.0	87244
FR-BAL-B-5.5k	FR-D/E740-120 FR-F740-00126 FR-A740-00170	1.750	16	44	3.7	87245
FR-BAL-B-7.5 k	FR-D740-170/FR-E740-160 FR-F740-00170 FR-A740-00250	1.220	23	59	5.5	87246
FR-BAL-B-11k/-15 k	FR-E740-230/300 FR-F740-00250/00310 FR-A740-00310/00380	0.667	42	68	10.7	71053
FR-BAL-B-22 k	FR-F740-00380/00470 FR-A740-00470/00620	0.483	58	77	11.2	87247
FR-BAL-B-30 k	FR-F740-00620/FR-A740-00770	0.369	76	86	11.6	87248
FR-BAL-B-37 k	FR-F740-00770/FR-A740-00930	0.295	95	113	18.6	87249
FR-BAL-B-45 k	FR-F740-00930/FR-A740-01160	0.244	115	118	21.4	71054
FR-BAL-B-55 k	FR-F740-01160/FR-A740-01800	0.191	147	120	22.6	87250

DC Reactors for FR-F700/FR-A700



DC link reactors

The DC link reactor is included as standard equipment with inverter models FR-A740/F740-01800 and above. This reactor is essential for the operation of the inverter and must be installed.

The reactors listed below are available as optional equipment for frequency inverter models FR-A/F740-00023 through 01160.

Reactor	Frequency inverter	Power loss [W]		Weight [kg]	Art. no.
		at 120 %	at 150 %		
FR-HEL-H90K	FR-A/F740-01800	128	121	20	The DC link reactor MT-HEL is included as standard equipment with the respective frequency inverter.
FR-HEL-H110K	FR-A/F740-02160	138	128	22	
FR-HEL-H132K	FR-A/F740-02600	140	138	26	
FR-HEL-H160K	FR-A/F740-03250	162	140	28	
FR-HEL-H185K	FR-A/F740-03610	245	162	29	
FR-HEL-H220K	FR-A/F740-04320	265	245	30	
FR-HEL-H250K	FR-A/F740-04810	285	265	35	
FR-HEL-H280K	FR-A/F740-05470	315	285	38	
FR-HEL-H315K	FR-A/F740-06100	350	315	42	
FR-HEL-H355K	FR-A/F740-06830	400	350	46	
FR-HEL-H400K	FR-A/F740-07700	460	400	50	
FR-HEL-H450K	FR-A/F740-08660	540	460	57	
FR-HEL-H500K	FR-A/F740-09620	635	540	67	
FR-HEL-H560K	FR-A/F740-10940	770	635	85	
FR-HEL-H630K	FR-A/F740-12120	960	770	95	

Note:

The AC supply choke can also be used as an alternative to the DC link reactor on frequency inverter models FR-A/F740-01160 and below.

Parameter units



The parameter unit FR-PU07 provides a 10-key keypad for a direct entering of numerical values. A 4-row LC display returns operational data, parameter names or status and error messages in uncoded text.

The parameter unit displays text in the following selectable languages: English, German, French, Spanish, Swedish, Italian, Finnish, and Japanese.

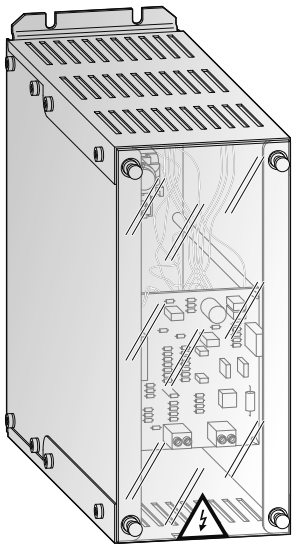
In addition to the functions of the standard parameter unit the FR-PU07 displays and monitors 21 different values (like frequency, current, voltage, etc.) and states in total.

The parameter unit FR-PU07 is used instead of the standard control units FR-DU04 and FR-DU07 and can be replaced by this after use.

The parameter unit FR-PU07 conforms to the protection rating IP 40.

Parameter unit	Frequency inverter	Description	Art. no.
FR-PA07	FR-D700/E700	Interactive parameter unit with LC display	214795
FR-DU07	All	Interactive parameter unit with LC display	157514
FR-DU07-IP54	All	Interactive parameter unit with LC display	207067
FR-PU07	FR-F700/A700	Interactive parameter unit with LC display	166134
FR-PU07BB	FR-E700/A700	Interactive parameter unit with LC display and battery pack	209052

■ Brake Units BU-UFS



For a braking torque higher than 20 % or a duty cycle higher than 30 % an external brake unit including the adequate brake resistors has to be installed.

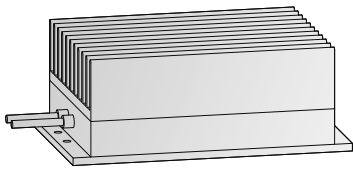
The brake units BU-UFS listed below are cascadeable so that the optimum size can always be achieved.

The brake units here are not fitted with brake resistors, which must be ordered separately (see below).

The configurations in the table are only general recommendations. Please consult Mitsubishi Electric Electric for advice on matching the correct brake modules and brake resistors for your application.

Brake unit	Frequency inverter	Rated voltage [V]	Max. peak current [A]	Max. instantaneous power [kW]	Max. duty cycle [%]	Art. no.
BU-UFS22	FR-D/E740 FR-A/F740-00023-00250	400	34	25	10	127947
BU-UFS40	FR-A/F740-00250-00470	400	55	41	10	127948
BU-UFS110	FR-A/F740-00470-01160	400	140	105	5	127950

■ Brake Resistors for Brake Unit BU-UFS

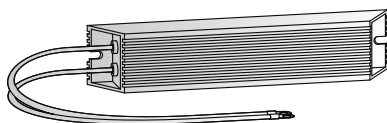


The brake resistors RUFC are designed for the exclusive use in combination with a brake unit BU-UFS.

Please note that the specifications for the allowed duty cycle (ED max.) included in the instruction manual for the brake unit.

Type	Application	Regenerative brake duty [%]	Resistance [Ω]	Capacity [W]	Art. no.
RUFC22	BU-UFS 22	10	1 × 24	2000	129629
RUFC40 (Set)	BU-UFS 40	10	2 × 6.8	2000	129630
RUFC110 (Set)	BU-UFS 110	10	4 × 6.8	2000	129631

External Brake Resistors FR-ABR-(H)□□k for FR-D700/E700 and FR-A700



Among the capacity range of the FR-D720S-025–100/FR-D740 (all) and FR-E740 (all) or FR-A700-00023–00620 the inverter is equipped with an internal brake chopper as standard.

An improvement of the brake duty is achieved by the use of an external brake resistor with a higher rated capacity.

The duty cycle is selectable via parameter 30 and can be specified, according to the inverter, up to 10 % respectively 30 % via parameter 70.

Brake resistor	Frequency inverter	Regenerative brake duty	Resistor [Ω]	Art. no.
FR-ABR-0.4 k	FR-D720S-025	10 % (ED)	200	46788
FR-ABR-0.75 k	FR-D720S-042	10 % (ED)	100	46602
FR-ABR-2.2 k	FR-D720S-070/100	10 % (ED)	60	46787
FR-ABR-H 0.4 k	FR-D740-012 FR-E740-016 FR-A740-00023	10 % (ED)	1200	46601
FR-ABR-H 0.75 k	FR-D740-022 FR-E740-026 FR-A740-00038	10 % (ED)	700	46411
FR-ABR-H 1.5 k	FR-D740-036 FR-E740-040 FR-A740-00052	10 % (ED)	350	46603
FR-ABR-H 2.2 k	FR-D740-050 FR-E740-060 FR-A740-00083	10 % (ED)	250	46412
FR-ABR-H 3.7 k	FR-D740-080 FR-E740-095 FR-A740-00126	10 % (ED)	150	46413
FR-ABR-H 5.5 k	FR-D740-120 FR-E740-120 FR-A740-00170	10 % (ED)	110	50045
FR-ABR-H 7.5 k	FR-D740-160 FR-E740-170 FR-A740-00250	10 % (ED)	75	50049
FR-ABR-H 11 k	FR-E740-230 FR-A740-00310	6 % (ED)	52	191577
FR-ABR-H 15 k	FR-E740-300 FR-A740-00380	6 % (ED)	2 × 18 serial	191578
FR-ABR-H 22 k	FR-A740-00470–00620	6 % (ED)	2 × 52 parallel	191579

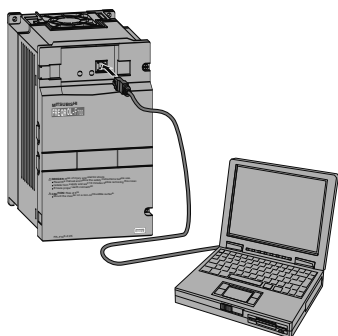
Software FR-Configurator

The Setup Software FR-Configurator is a powerful tool for the operation of your frequency inverter.

The software runs under all versions of MS Windows and therefore allows the inverter operation via any conventional personal computer. Several frequency inverters can be set up, operated, and monitored simultaneously across a network or via a personal computer or laptop.

The Software FR-Configurator is designed for all frequency inverters of the 700-series.

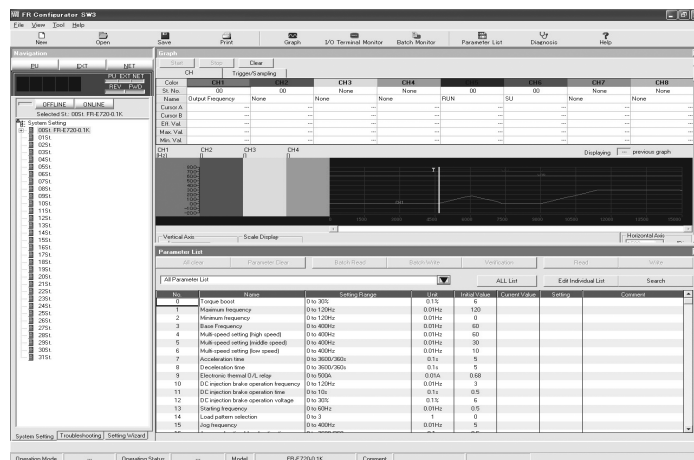
The connection between personal computer and inverter is established either via an RS485 network or directly via an SC-FR PC adapter cable available separately. For the FR-E700/FR-A700 series a USB-connector is also available.



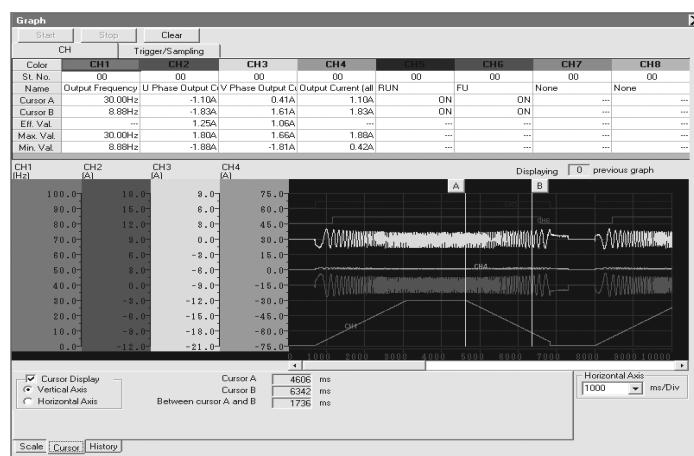
Benefits

- **System settings**
Due to the network capabilities of the inverter up to 32 frequency inverters can be operated simultaneously.
- **Parameter settings**
By means of overall and function related overviews different parameters can be adjusted easily.
- **Display functions**
The comprehensible display functions enable data, analog, oscillograph, and alarm displays.
- **Diagnostics**
The analysis of the inverter status provides a thorough error correction.
- **Test operation**
The test operation provides a simulation of the operation and adjustment via the auto-tuning function.
- **File management**
Parameters can be saved on the personal computer and printed out.
- **Help**
The extensive online help provides support concerning all questions regarding settings and operation.

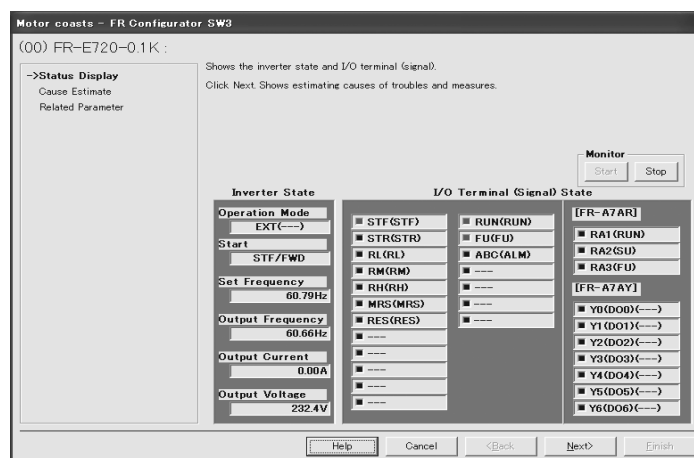
Parameter setting



Display and monitor

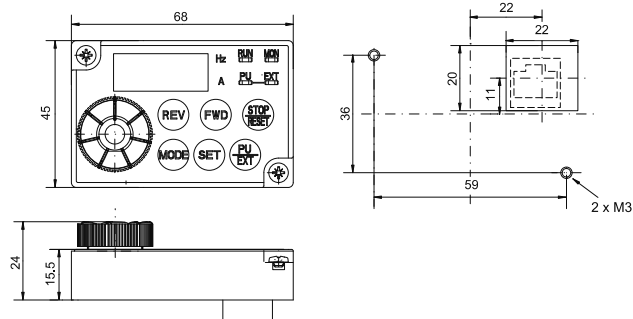


Test operation

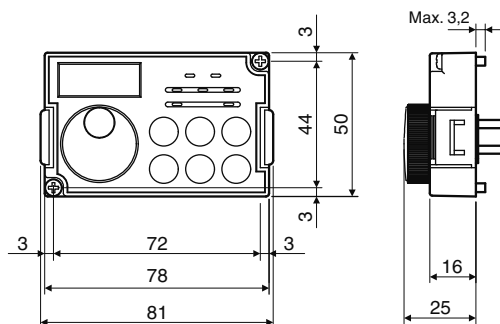


■ Parameter Units FR-PA07 and FR-DU07/FR-DU07-IP 54

FR-PA07

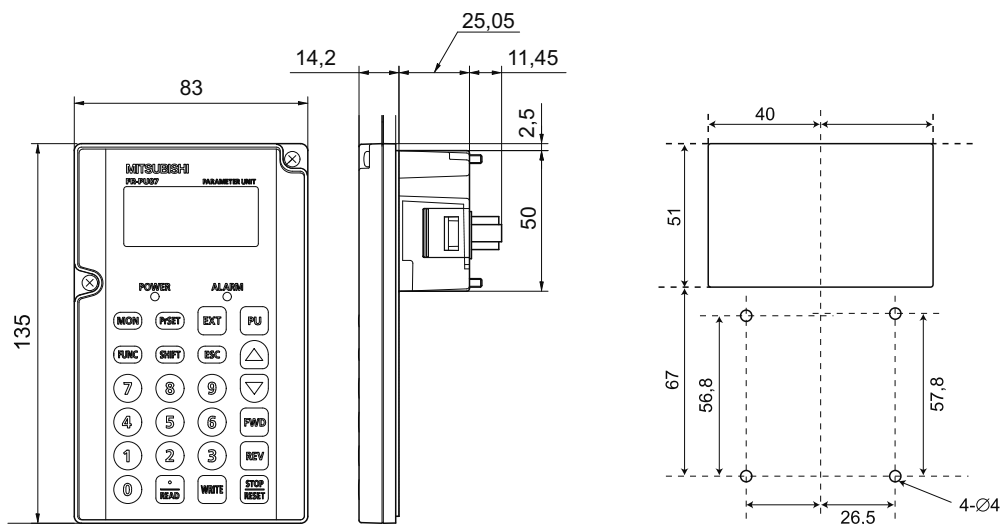


FR-DU07



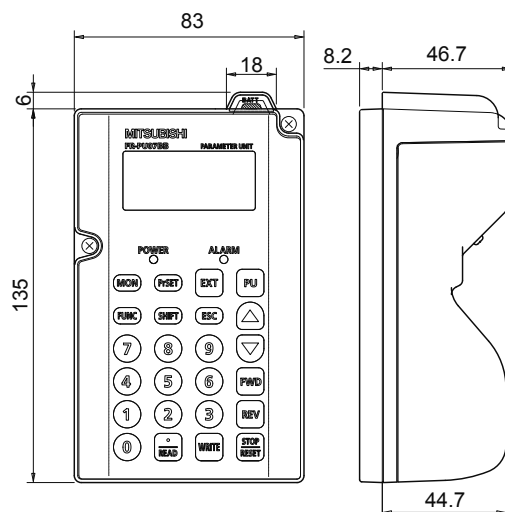
All dimensions in mm

■ Parameter Unit FR-PU07



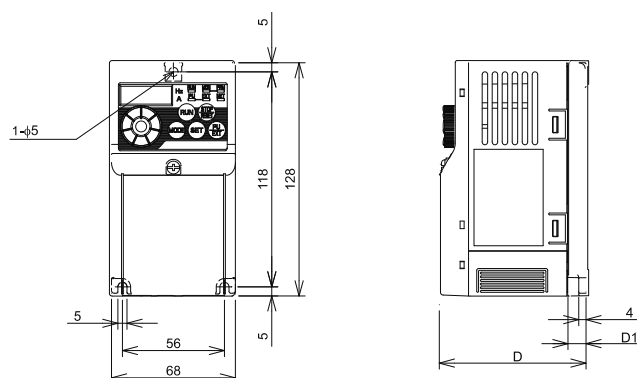
All dimensions in mm

■ Parameter Unit FR-PU07BB



All dimensions in mm

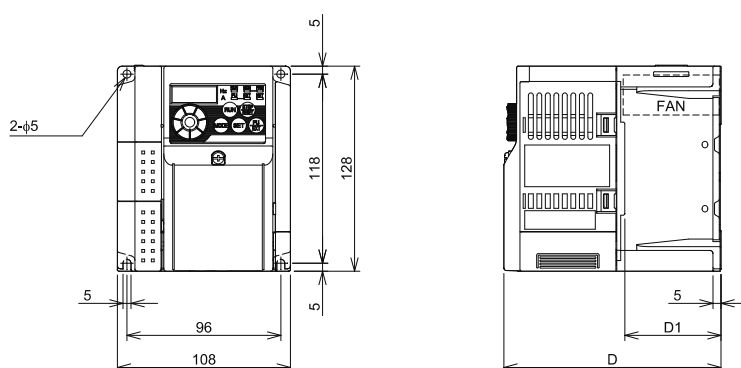
FR-D720S-008-042



Type	D	D1
FR-D720S-008-014	80.5	10
FR-D720S-025	142.5	42
FR-D720S-042	162.5	62

All dimensions in mm

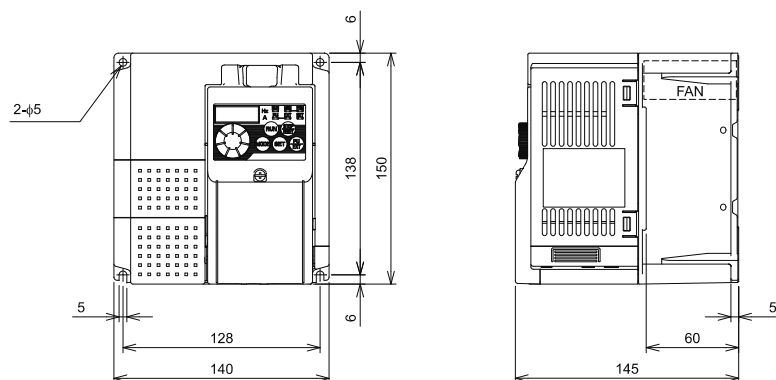
FR-D720S-070/FR-D740-012-080



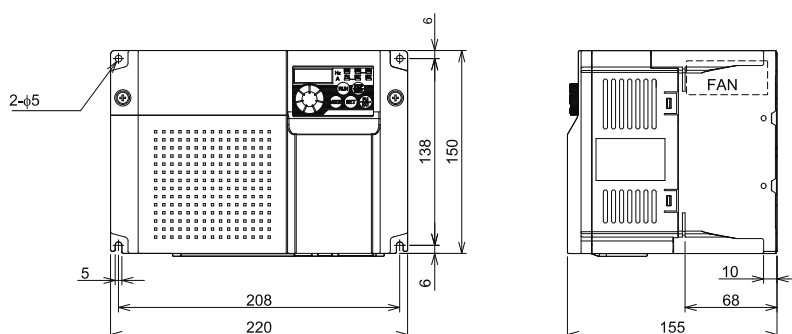
Type	D	D1
FR-D720S-070	155	60
FR-D740-012/022	129.5	54
FR-D740-036	135.5	60
FR-D740-050	155.5	
FR-D740-080	165.5	

All dimensions in mm

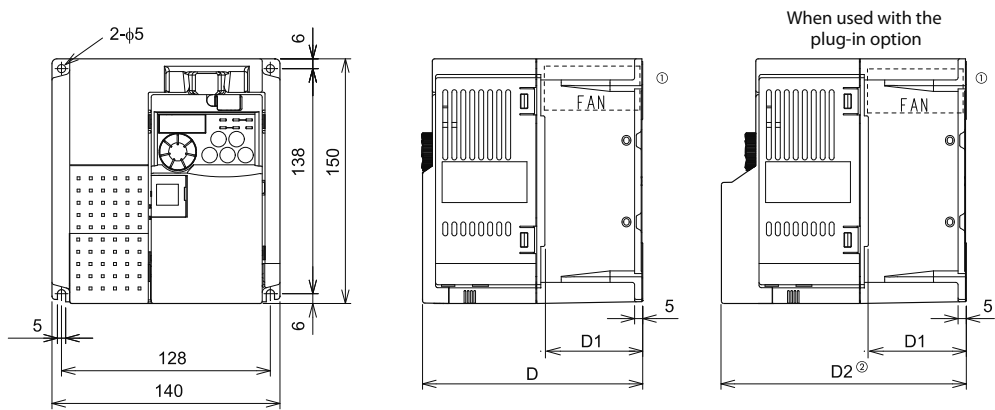
FR-D720S-100



FR-D740-120/160



FR-E740-016-095

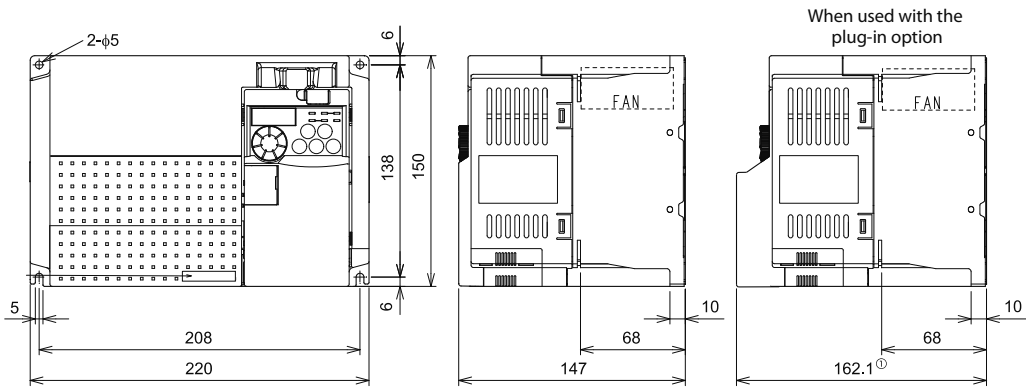


Type	D	D1	D2
FR-E740-016/026	114	39	129.1
FR-E740-040-095	135	60	150.1

All dimensions in mm

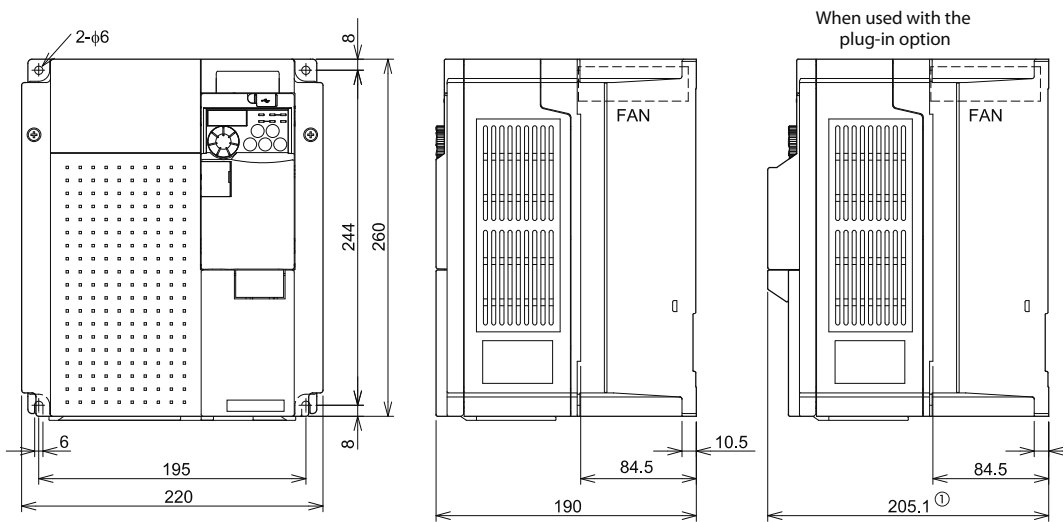
- ① FR-E740-016 and -026 are not provided with the cooling fan.
- ② When the FR-A7NC E kit is mounted, a terminal block protrudes making the depth approx. 2 mm greater.

FR-E740-120/170



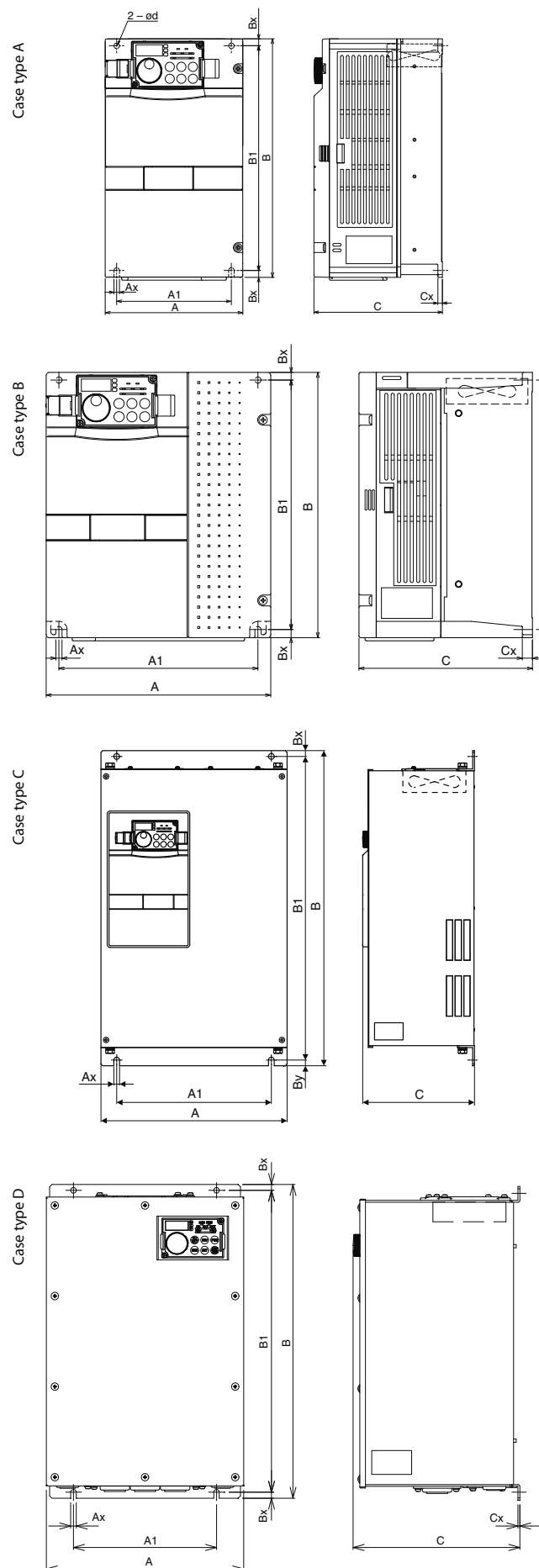
- ① When the FR-A7NC E kit is mounted, a terminal block protrudes making the depth approx. 2 mm greater.

FR-E740-230/300



- ① When the FR-A7NC E kit is mounted, a terminal block protrudes making the depth approx. 2 mm greater.

FR-F740/FR-F746

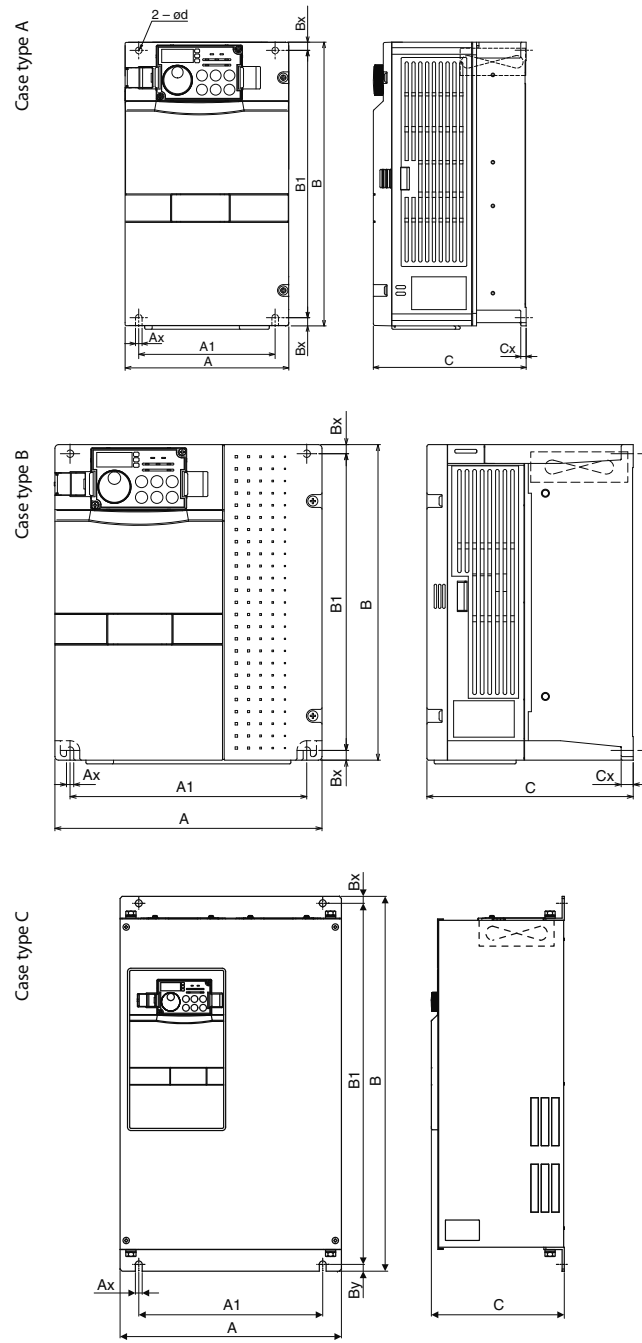


Type	A	A1	Ax	B	B1	Bx	C	Cx	d	Case type
FR-F740-00023-00126	150	125	6	260	245	7.5	140	5	6	A
FR-F740-00170/00250	220	195	6	260	245	7.5	170	10	8	B
FR-F740-00310/00380	220	195	6	300	285	7.5	190	10	8	B
FR-F740-00470/00620	250	230	10	400	380	10	190	10	10	B
FR-F740-00770	325	270	10	550	530	10	195	3.2	10	C
FR-F740-00930/01160	435	380	12	550	525	15	250	3.2	12	C
FR-F740-01800	435	380	12	550	525	15	250	3.2	12	C
FR-F740-02160/02600	465	400		620	595	15	300	3.2	12	C
FR-F740-03250/03610	465	400		740	715	15	360	3.2	12	C
FR-F740-04320/04810	498	400	49	1010	984	13	380	3.2	12	C
FR-F740-05470-06830	680	600	40	1010	984	13	380	3.2	12	C
FR-F740-07700/08660	790	635	80	1330	1300	15	440	3.2	12	C
FR-F740-09620-12120	995	900	47.5	1580	1550	15	440	3.2	12	C
FR-F746-00023-00126	249	180	7	395	380	7.5	210	2.3		D
FR-F746-00170/00250	319	255	7	395	380	7.5	240	2.3		D
FR-F746-00310/00380	319	258	10	445	425	10	260	2.3		D
FR-F746-00470/00620	354	312	10	560	540	10	260	2.3		D
FR-F746-00770	360	300	10	590	570	10	265	3.2		D
FR-F746-00930/01160	471	411	12	660	635	15	320	3.2		D

Please consider also the dimensions of the corresponding DC reactors (see pages 52 and 53)

All dimensions in mm

FR-A700

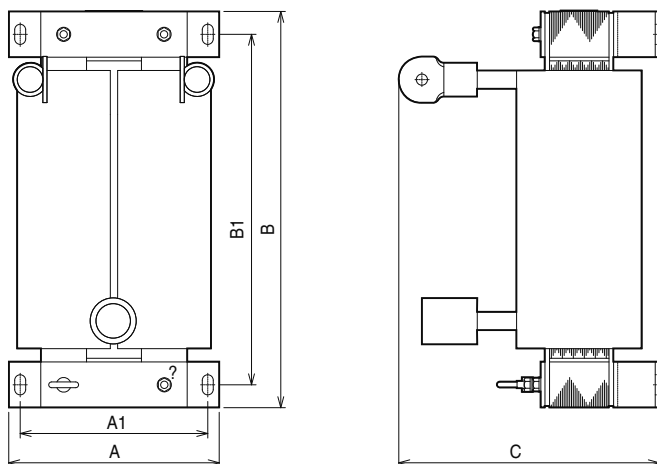


Type	A	A1	Ax	B	B1	Bx	C	Cx	d	Case type
FR-A740-00023-00126	150	125	6	260	245	7.5	140	5	6	A
FR-A740-00170/00250	220	195	6	260	245	7.5	170	10	8	B
FR-A740-00310/00380	220	195	6	300	285	7.5	190	10	8	B
FR-A740-00470/00620	250	230	10	400	380	10	190	10	10	B
FR-A740-00770	325	270	10	550	530	10	195	3.2	10	C
FR-A740-00930/01160	435	380	12	550	525	15	250	3.2	12	C
FR-A740-01800	435	380	12	550	525	15	250	3.2	12	C
FR-A740-02160/02600	465	400		620	595	15	300	3.2	12	C
FR-A740-03250/03610	465	400		740	715	15	360	3.2	12	C
FR-A740-04320/04810	498	400	49	1010	984	13	380	3.2	12	C
FR-A740-05470-06830	680	600	40	1010	984	13	380	3.2	12	C
FR-A740-07700-08660	790	635	80	1330	1300	15	440	3.2	12	C
FR-A740-09620-12120	995	900	47.5	1580	1550	15	440	3.2	12	C

Please consider also the dimensions of the corresponding DC reactors (see pages 52 and 53)

All dimensions in mm

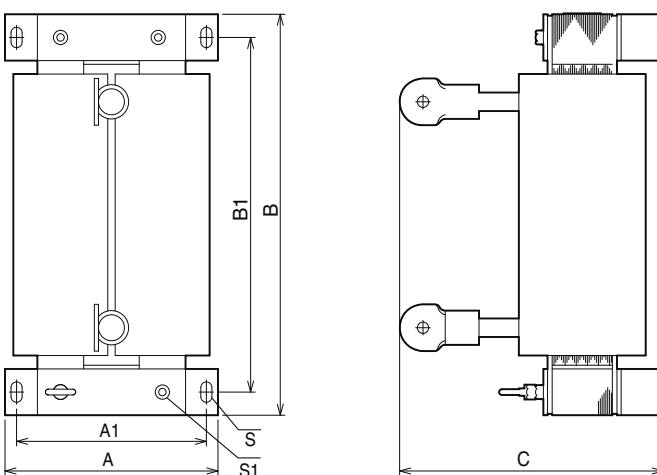
DC Reactor FR-HEL-H90K



Choke	Frequency inverter	A	A1	B	B1	C	Weight [kg]
FR-HEL-H90K	FR-A/F740-01800	150	130	340	310	190	20

All dimensions in mm

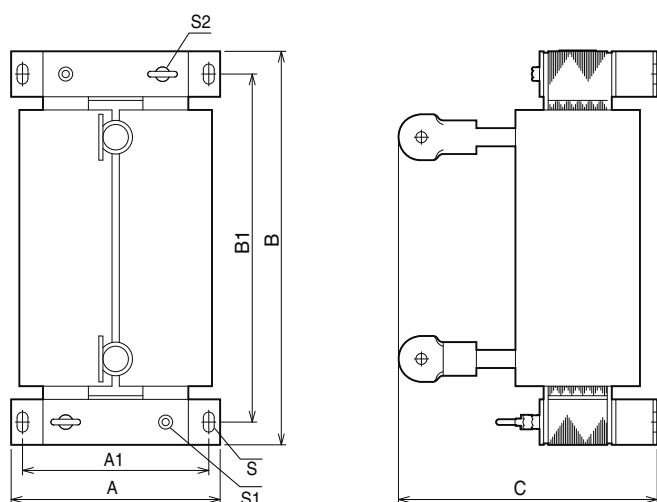
DC Reactors FR-HEL-H110K–160K



Choke	Frequency inverter	A	A1	B	B1	C	S	S1	Weight [kg]
FR-HEL-H110K	FR-A/F740-02160	150	130	340	310	195	M6	M6	22
FR-HEL-H132K	FR-A/F740-02600	175	150	405	370	200	M8	M6	26
FR-HEL-H160K	FR-A/F740-03250	175	150	405	370	205	M8	M6	28

All dimensions in mm

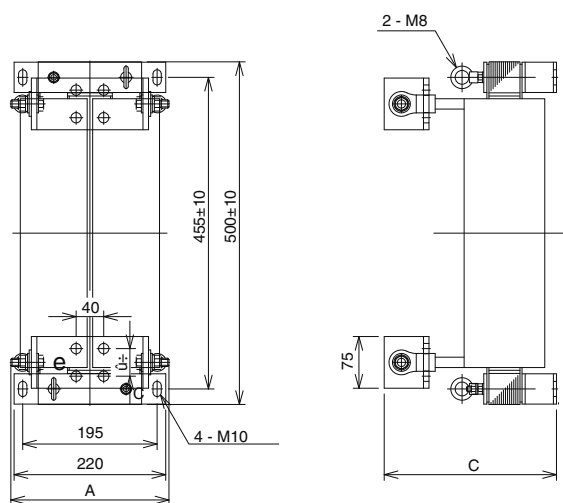
DC Reactors FR-HEL-H185K–355K



Choke	Frequency inverter	A	A1	B	B1	C	S	S1	S2	Ø	Weight [kg]
FR-HEL-H185K	FR-A/F740-03610	175	150	405	370	240	M8	M6	—	M12	29
FR-HEL-H220K	FR-A/F740-04320	175	150	405	370	240	M8	M6	M6	M12	30
FR-HEL-H250K	FR-A/F740-04810	190	165	440	400	250	M8	M8	M8	M12	35
FR-HEL-H280K	FR-A/F740-05470	190	165	440	400	255	M8	M8	M8	M16	38
FR-HEL-H315K	FR-A/F740-06100	210	185	495	450	250	M10	M8	M8	M16	42
FR-HEL-H355K	FR-A/F740-06830	210	185	495	450	250	M10	M8	M8	M16	46

All dimensions in mm

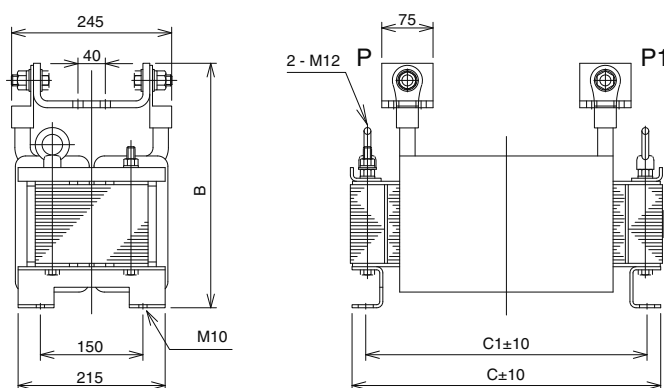
DC Reactors FR-HEL-H400K-450K



Choke	Frequency inverter	A	C	Weight [kg]
FR-HEL-H400K	FR-A/F740-07700	235	250	50
FR-HEL-H450K	FR-A/F740-08660	240	270	57

All dimensions in mm

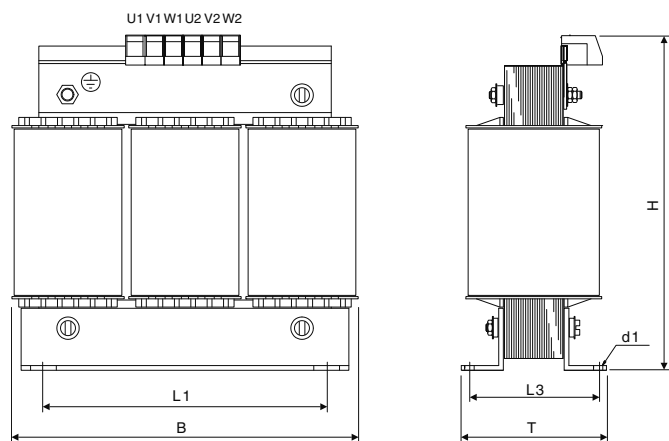
DC Reactors FR-HEL-H500K-630K



Choke	Frequency inverter	B	C	C1	Weight [kg]
FR-HEL-H500K	FR-A/F740-09620	345	455	405	67
FR-HEL-H560K	FR-A/F740-10940	360	460	410	85
FR-HEL-H630K	FR-A/F740-12120	360	460	410	95

All dimensions in mm

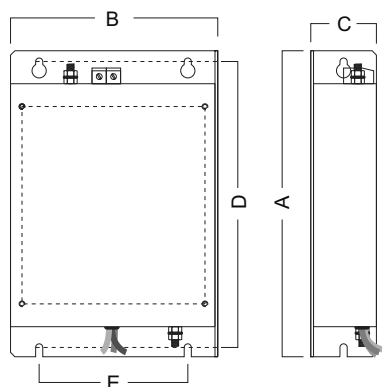
AC Chokes FR-BAL-B-□□k



Choke	Frequency inverter	B	T	H	L1	L3	d1	Weight [kg]
FR-BAL-B-4.0 k	FR-D740-012-080 FR-E740-016-095 FR-F740-00023-00083 FR-A740-00023-00126	125	82	130	100	56	5 x 8	3.0
FR-BAL-B-5.5 k	FR-D/E740-120 FR-F740-00126 FR-A740-00170	155	85	145	130	55	8 x 12	3.7
FR-BAL-B-7.5 k	FR-D740-170/FR-E740-160 FR-F740-00170 FR-A740-00250	155	100	150	130	70	8 x 12	5.5
FR-BAL-B-11 k	FR-E740-230/300 FR-F740-00250/00310 FR-A740-00310/0380	155	100	150	130	70	8 x 12	5.5
FR-BAL-B-15 k	FR-E740-230/300 FR-F740-00250/00310 FR-A740-00310/0380	190	115	210	170	79	8 x 12	10.7
FR-BAL-B-22 k	FR-F740-00380/00470 FR-A740-00470/00620	190	115	210	170	79	8 x 12	11.2
FR-BAL-B-30 k	FR-F740-00620/FR-A740-00770	190	118	230	170	79	8 x 12	3.0
FR-BAL-B-37 k	FR-F740-00770/FR-A740-00930	210	128	265	175	97	8 x 12	3.7
FR-BAL-B-45 k	FR-F740-00930/FR-A740-01160	230	165	280	180	122	8 x 12	5.5
FR-BAL-B-55 k	FR-F740-01160/FR-A740-01800	240	140	305	190	97	11 x 12	10.7

All dimensions in mm

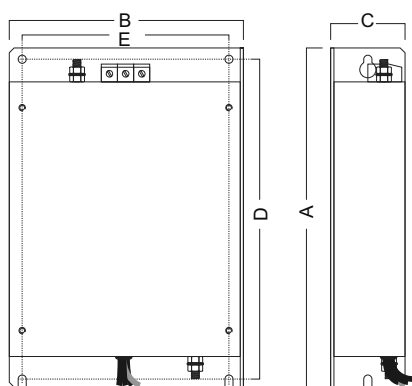
Noise Filters for FR-D720S



Filter	Frequency inverter	A	B	C	D	E
FFR-CS-050-14A-RF1	FR-D720S-008-042	168	72	38	158	56
FFR-CS-080-20A-RF1	FR-D720S-070	168	113	38	158	96
FFR-CS-110-26A-RF1	FR-D720S-100	214	145	46	200	104

All dimensions in mm

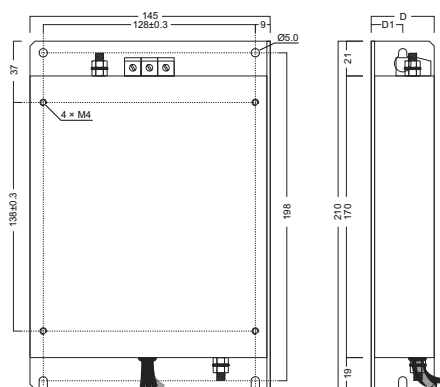
Noise Filters for FR-D740



Filter	Frequency inverter	A	B	C	D	E
FFR-CSH-036-8A-RF1	FR-D740-012-036	168	114	45	158	96
FFR-CSH-080-16A-RF1	FR-D740-050/080	168	114	45	158	96
FFR-MSH-170-30A-RF1	FR-D740-120/160	210	225	55	198	208

All dimensions in mm

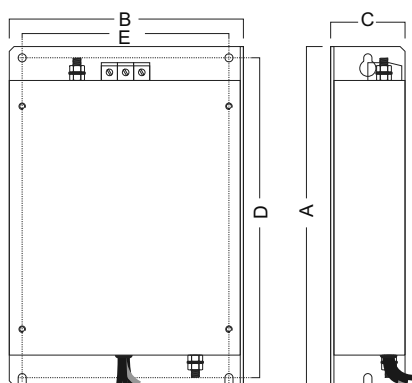
Noise Filters for FR-E740-016-095



Filter	Frequency inverter	D	D1
FFR-MSH-040-8A-RF1	FR-E740-016-040	38	19
FFR-MSH-095-16A-RF1	FR-E740-060/095	46	23

All dimensions in mm

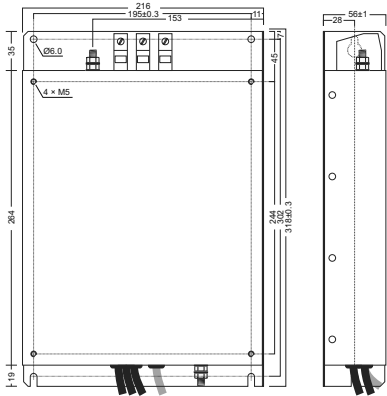
Noise Filter for FR-E740-120/170



Filter	Frequency inverter	A	B	C	D	E
FFR-MSH-170-30A-RF1	FR-E740-120/170	210	225	55	198	208

All dimensions in mm

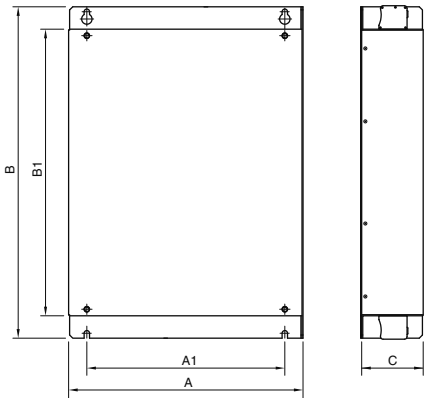
■ Noise Filter for FR-E740-230/300



Filter	Frequency inverter
FFR-MSH-300-50A-RF1	FR-E740-230/300

All dimensions in mm

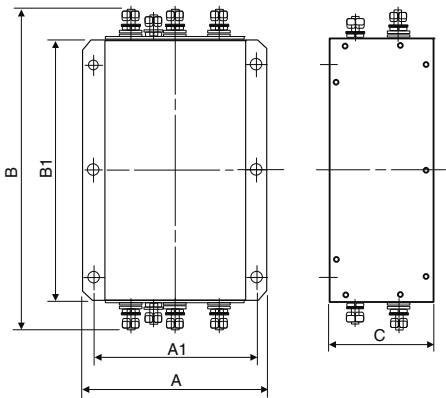
■ Noise Filters for FR-A/F740-00023 to -01800



Filter	Frequency inverter	A	A1	B	B1	C
FFR-BS-00126-18A-SF100	FR-A/F740-00023-00126	150	110	315	260	50
FFR-BS-00250-30A-SF100	FR-A/F740-00170/00250	220	180	315	260	60
FFR-BS-00380-55A-SF100	FR-A/F740-00310/00380	221,5	180	360	300	80
FFR-BS-00620-75A-SF100	FR-A/F740-00470/00620	251,5	210	476	400	80
FFR-BS-00770-95A-SF100	FR-A/F740-00770	340	280	626	550	90
FFR-BS-00930-120A-SF100	FR-A/F740-00930	450	380	636	550	120
FFR-BS-01800-180A-SF100	FR-A/F740-00930/01800	450	380	652	550	120

All dimensions in mm

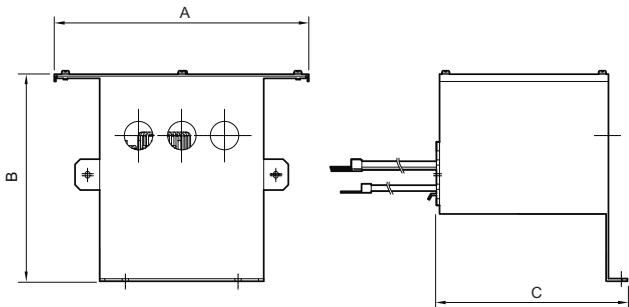
■ Noise Filters for FR-A/F740-02160 to -12120



Filter	Frequency inverter	A	A1	B	B1	C
FN 3359-250-28	FR-A/F740-02160-02600	230	205	360	300	125
FN 3359-400-99	FR-A/F740-03250-04320	260	235	386	300	115
FN 3359-600-99	FR-A/F740-04810-06100	260	235	386	300	135
FN 3359-1000-99	FR-A/F740-06830-09620	280	255	456	350	170
FN 3359-1600-99	FR-A/F740-10940-12120	300	275	586	400	160

All dimensions in mm

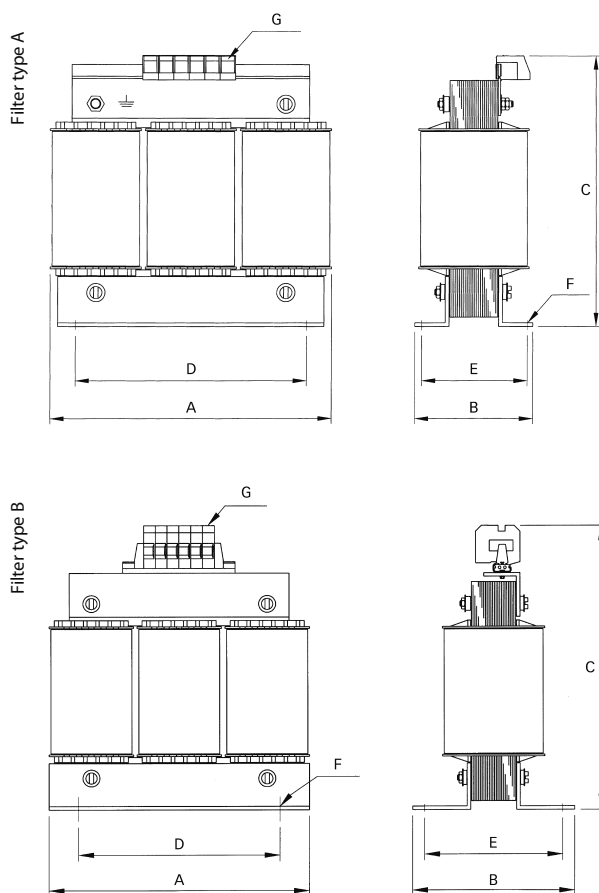
■ Noise Filters for FR-F746-00023 to -01160



Filter	Frequency inverter	A	B	C
FFR-AF-IP54-21A-SM 2	FR-A/F746-00023-00126	248,5	201	186,5
FFR-AF-IP54-44A-SM 2	FR-A/F746-00170-00250	318,5	231	231,5
FFR-AF-IP54-62A-SM 2	FR-A/F746-00310-00380	318,5	251	239,5
FFR-AF-IP54-98A-SM 2	FR-A/F746-00470-00620	350	251	308
FFR-AF-IP54-117A-SM 2	FR-A/F746-00770	325	185	308
FFR-AF-IP54-172A-SM 2	FR-A/F746-00930-01160	464	301,5	481

All dimensions in mm

du/dt Filter

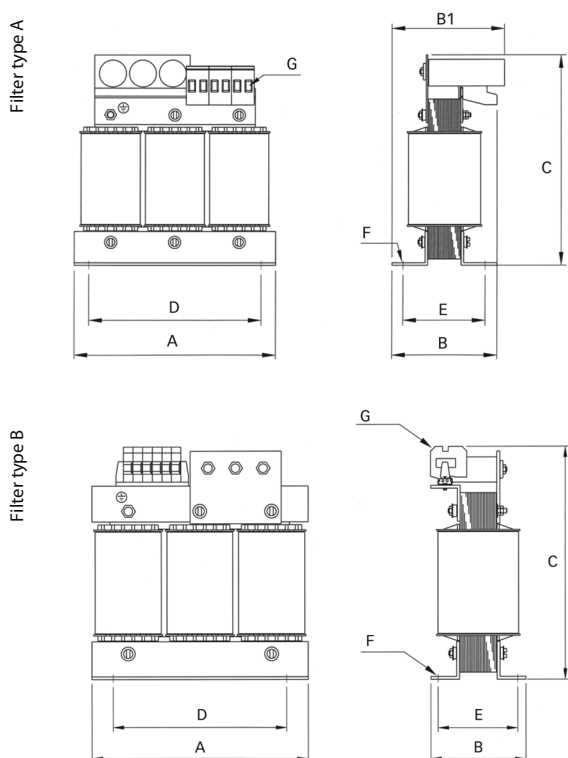


du/dt Filter	A	B	C	D	E	F	G	Type
FFR-DT-10A-SS1	100	65	120	56	43	4.8×8	2.5 mm ²	A
FFR-DT-25A-SS1	125	80	140	100	55	5×8	4 mm ²	A
FFR-DT-47A-SS1	155	110	195	130	70	8×12	10 mm ²	A
FFR-DT-93A-SS1	190	100	240	130	70	8×12	16 mm ²	A
FFR-DT-124A-SS1	190	150	170	130	67	8×12	35 mm ²	B
FFR-DT-182A-SS1	210	160	185	175	95	8×12	ø10	B
FFR-DT-330A-SS1	240	240	220	190	135	11×15	ø12	B
FFR-DT-500A-SS1	240	220	325	190	119	11×15	ø10	B
FFR-DT-610A-SS1	240	230	325	190	128	11×15	ø11	B
FFR-DT-683A-SS1	240	230	325	190	128	11×15	ø11	B
FFR-DT-790A-SS1	300	218	355	240	136	11×15	ø11	B
FFR-DT-1100A-SS1	360	250	380	310	144	11×15	ø11	B
FFR-DT-1500A-SS1	360 ^①	250 ^①	①	①	①	①	①	B
FFR-DT-1920A-SS1	360 ^①	250 ^①	①	①	①	①	①	B

① Under review, may be subject to change

All dimensions in mm

Sinusoidal Filter

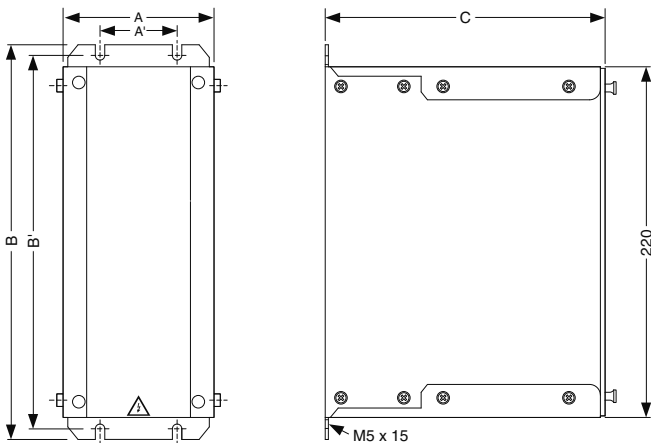


Sinusoidal Filter	A	B	C	D	E	F	G	Type
FFR-SI-4.5A-SS1	125	75	180	100	55	5×8	2.5 mm ²	A
FFR-SI-8,3A-SS1	155	95	205	130	70	8×12	4 mm ²	A
FFR-SI-18A-SS1	190	120	230	170	78	8×12	10 mm ²	A
FFR-SI-25A-SS1	210	125	260	175	85	8×12	10 mm ²	A
FFR-SI-32A-SS1	210	135	260	175	95	8×12	10 mm ²	A
FFR-SI-48A-SS1	240	210	290	190	125	8×12	10 mm ²	B
FFR-SI-62A-SS1	240	220	290	190	135	8×12	16 mm ²	B
FFR-SI-77A-SS1	300	210	345	240	134	11×15	35 mm ²	B
FFR-SI-93A-SS1	300	215	345	240	139	11×15	35 mm ²	B
FFR-SI-116A-SS1	300	237	345	240	161	11×15	50 mm ²	B
FFR-SI-180A-SS1	450	≤ 360	400	400	235	13×26	2×ø11	
FFR-SI-260A-SS1	450	≤ 360	510	400	235	13×26	2×ø11	
FFR-SI-432A-SS1	480	≤ 400	640	430	330	13×26	2×ø11	
FFR-SI-481A-SS1	600	≤ 440	325	430	310	13×26	2×ø13	
FFR-SI-683A-SS1	620	≤ 550	745	570	300	13×26	2×ø13	
FFR-SI-770A-SS1	660	≤ 540	690	610	350	13×26	2×ø13	
FFR-SI-880A-SS1	660	≤ 560	895	610	350	13×26	4×ø13	
FFR-SI-1212A-SS1	740	≤ 550	940	690	360	13×26	4×ø13	
FFR-SI-1500A-SS1 ^①	①	①	①	①	①	①	①	
FFR-SI-1700A-SS1 ^①	①	①	①	①	①	①	①	

① Under review, may be subject to change

All dimensions in mm

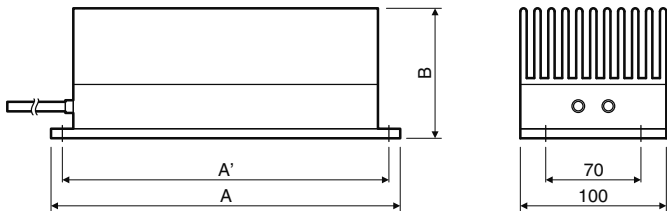
■ Brake Units BU-UFS



Brake unit	A	A'	B	B'	C	Weight [kg]
BU-UFS22J	100	50	250	240	175	2.4
BU-UFS22	100	50	250	240	175	2.5
BU-UFS40	100	50	250	240	175	2.5
BU-UFS110	107	50	250	240	195	3.9

All dimensions in mm

■ External Brake Resistor RUFC

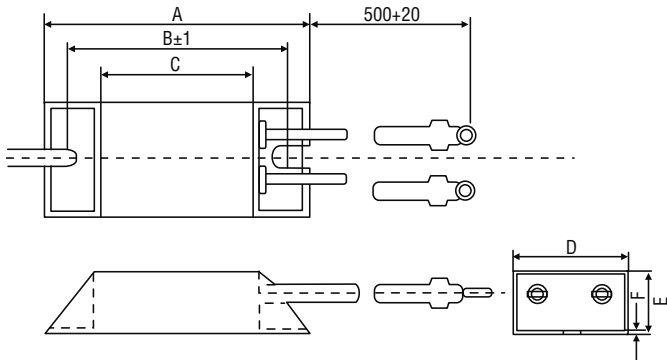


Brake resistor	A	A'	B	Weight [kg]
RUFC22	310	295	75	4.7
RUFC40	365	350	75	9.4
RUFC110	365	350	75	18.8

Remark: RUFC40 contains a set of two brake resistors, and RUFC110 contains a set of four brake resistors as shown on the left.

All dimensions in mm

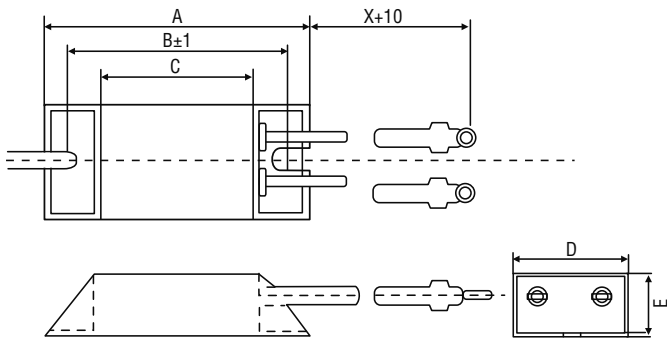
■ External Brake Resistors FR-ABR-□□k



Brake resistor	A	B	C	D	E	F	Weight [kg]
FR-ABR-0.4 k	115	100	75	40	20	2.5	0.2
FR-ABR-0.75 k	140	125	100	40	20	2.5	0.2
FR-ABR-1.5 k	215	200	175	40	20	2.5	0.4
FR-ABR-2.2 k	240	225	200	50	25	2.0	0.5

All dimensions in mm

■ External Brake Resistors FR-ABR-H□□k

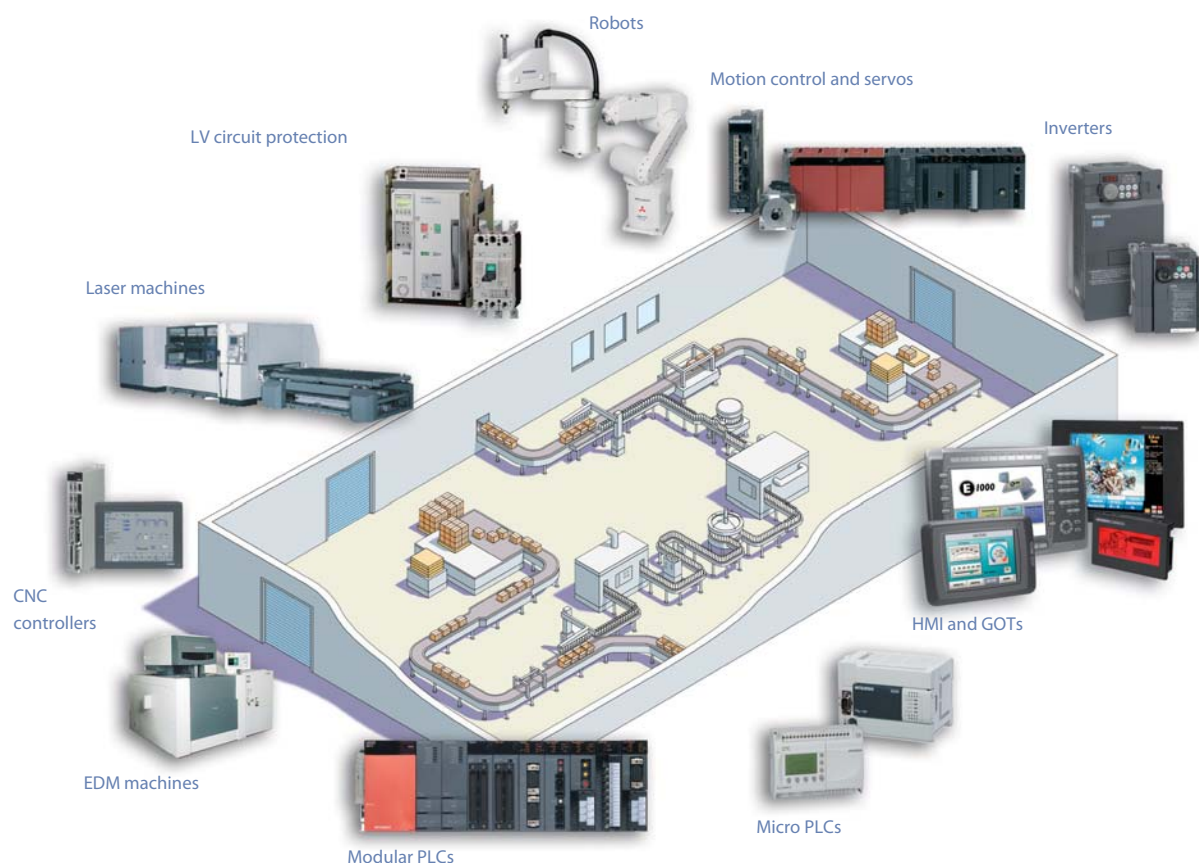


Brake resistor	A	B	C	D	E	X	Weight [kg]
FR-ABR-H0.4 k	115	100	75	40	20	500	0.2
FR-ABR-H0.75 k	140	125	100	40	20	500	0.2
FR-ABR-H1.5 k	215	200	175	40	20	500	0.4
FR-ABR-H2.2 k	240	225	200	50	25	500	0.5
FR-ABR-H3.7 k	215	200	175	60	30	500	0.8
FR-ABR-H5.5 k	335	320	295	60	30	500	1.3
FR-ABR-H7.5 k	400	385	360	80	40	500	2.2
FR-ABR-H 11 k	400	—	—	100	50	700	3.2
FR-ABR-H 15 k	300	—	—	100	50	700	2.4 (x2) serial
FR-ABR-H 22 k	400	—	—	100	50	700	3.3 (x2) parallel

All dimensions in mm

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